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MEETING OF THE SECTION OF SURGERY. JUNE 12, 1917.

THE MODERN TREATMENT OF BURNS, WITH ESPECIAL REFERENCE TO SEVERE BURNS AND TO THE USE OF AMBRINE AND ITS SUBSTITUTES.

BY EDWARD HAMMOND RISLEY, M.D., BOSTON.

PART I.

THIS paper and investigation were stimulated by the feeling that the present-day treatment of burns, both severe and trivial, leaves much to be desired, both in method of treatment and in end-results,—mortality and contractures. This is a class of cases of which every large hospital has at least from fifty to a hundred each year, in which results are obviously poor and in which very little detail interest is taken either by the surgeon or the house officer in charge.

Mortality is high, the period of disability is long and disabling, and deforming contractures are too common. From an economic point of view, to say nothing of suffering entailed, these cases should have better treatment.

Our investigation, founded on a detailed study of a series of cases under personal observation and treatment since May, 1914, a study and tabulation of all burned cases treated at the Massachusetts General Hospital for the past ten years, and a review of the literature, has aimed to settle the question of the best general plan of treatment, especially that of the kind of dressing, the prevention of sepsis and contractures, and shortening of the period of disability.

The author wishes to take this opportunity to thank the various members of the surgical staff of the Massachusetts General Hospital for courtesy extended to him in granting him the privilege of directing the care of the burned cases during this study, and also to the house officers on duty for very willing and ready coöperation.

The literature contains a few scattered observations on individual cases but only one treatise of value. This is a rather remarkable book by Dr. Herman Pfeiffer, in German, "Das Problem Des Verbrühunstodes," which takes up all phases of this question and is remarkable for the thoroughness with which it is presented and the detail into which it goes.

The clinical picture of the effects of severe thermal injury we have come to recognize as that of a profound toxemia, showing itself in the general toxic appearance of the patient, elevation of the temperature, etc., and by the effect of this toxic absorption on the kidneys, metabolism and gastrointestinal tract.

That the condition is actually one of a toxemia we also have convincing experimental proof, especially in Pfeiffer's exhaustive study. He looks upon the condition as one resulting from an auto-intoxication from the destruction of proteid bodies at the site of injury, or, in other words, a hyperproduction uremia or a toxicosis from pathologically increased proteid destruction and absorption.

In experimental work it is found that prompt removal of the burned area may be a life-saving measure in animals as well as in man. The transplantation of a burned area on to an uninjured animal may produce death with the same toxic and urinary symptoms as if the burn had been originally inflicted on the recipient of the transplant. In parabiotic animals the injured animal dies quickly, while the healthy mate dies later with the same symptoms, unless severed early. The blood of severely burned persons has been found toxic for guinea-pigs. The experiments on metabolism in Pfeiffer's work are highly technical but all go to establish more firmly the theory of toxic absorption. The picture, therefore, of the effects of severe burns develops in a clear manner to the well-recognized symptom-complex which in recent years we have learned to associate with peptone poisoning, with anaphylactic shock, hemolysin poisoning, uremia; in short, to the picture of a toxicosis from protein destruction.

The problem of the treatment of the burned patient is a broad and complicated one and divides itself, we believe, as follows:

1. The treatment of shock: when present.
2. The selection of the best form of treatment for the burned area, which subdivides itself into:
   (a) The kind of first dressing to use, and
   (b) The prevention of sepsis.
3. The problem of the prevention and treatment of contractures.
4. Prevention and treatment of complications, especially acute toxic nephritis and duodenal ulcer and the question of their relation to the toxemia, and the question of prognosis according to extent of surface burned and how to measure this.

1. TREATMENT OR PREVENTION OF SHOCK.

This is absolutely the first consideration and has been noticeably neglected in the past. Our first thought should not be to get the patient's clothes off and get a dressing on, but it should be "How much is this patient in shock and how can it best be combated?" No attempt should be made to move the patient until he has been relieved of his suffering by a good generous dose of morphia. If he is in marked shock he should be treated by methods best known to combat it, especially by the use of subpectoral salt infusion, and rectal shock enemata. Meanwhile, exposed areas should be lightly covered with a warm blanket to prevent chilling. If the patient receives benefit from this treatment within a half hour, one of three courses is open to us.

a. The clothing may be carefully cut away from the whole body and the patient placed exposed to the air, with the temperature of the room elevated to about 110° by open fire or other means; the open air treatment, or

b. He may be treated with some form of medicated dressing.

(1) He may be swathed with compress cloth saturated with a solution of from 1 to 5 per cent. picric acid. This dressing is best applied in sections and held lightly in place by roller bandage. If put on in sections it can be removed piecemeal and thus add less to the patient's later discomfort or shock. This first dressing may be left on for 48 hours before being disturbed at all.

(2) The burned area, if not extensive, may be painted with tincture of chlorid of iron and the patient left without dressing in a warm room. (The relative values and results of these forms of treatment will be discussed later.)

c. Should the patient not recover rapidly from his shock he should be immediately immersed in a continuous hot (90°-110°) saline or boric acid solution bath, the clothing to be cut away *after* the patient has been immersed and not previously. For in cases of severe burn the shock caused by the first dressing is always a serious consideration and may be fatal. This is substantiated by many case histories in the hospital records in which profound shock and death followed the first attempt at dressing. For instance, there have been many cases who were brought to the hospital in moderate shock who recovered somewhat while resting on the shock table but who, after the agony of removal of clothing, or the application of the first dressing, died an hour or so later with distinct signs of recurrent or delayed shock. We feel that this detail of treatment has often been overlooked and has been the actual cause of many possibly avoidable deaths. Therefore, the longer we can postpone the first dressing the better it will be for the patient, to whom every hour is of advantage in recovering from his primary shock.

Regardless of time, the patient should be kept in the hot bath until he has recovered from his shock and he should be reimmersed immediately should he, on removal, show signs of recurring shock.

This salt solution bath is of great benefit not only to the patient's general condition, but also furnishes nutrition to the devitalized cells that cannot be reached by the blood current now shut off by the thrombosis, which occludes much of the superficial capillary circulation. And it is essential to save the life of every cell, especially epithelial cells, which later are the regenerations of true skin. This bath has been found of great—even life-saving—value in the later or granulating stage of extensive burns when dressings could not be borne and the patient is in an exhausted condition—especially in children.

Our prime consideration, therefore, is the prevention and treatment of shock, by prolonging as long as possible and minimizing as much as possible the trauma of the first dressing, by warmth, by plenty of morphia, by flooding the system with fluids, and by the use of medicinal stimulation if necessary. This is our first duty and is a thing which the writer knows from personal experience has not secured the

careful detailed attention in the past that it should receive. The burned case comes to us in shock which is both psychic and physical. If we hasten to get some sort of dressing on his local injury instead of first treating his psychic shock by the beneficent influence of morphia, and his physical shock by this and other well recognized means, we miss the whole point in the solution of this problem and add greatly to his already devitalized condition and increase his chances of death rather than of recovery. Too much stress cannot be laid on this very vital but often lightly considered part of the problem of the care of burned cases.

2. THE SELECTION OF THE BEST FORM OF DRESSING.

As shock and sepsis are for all practical considerations the only causes of death, let us turn to the second phase of our problem, the selection of the best form of local treatment, which is so closely related to the problem of the prevention of sepsis.

First Dressing.—We have adopted the rule never to use oily dressings; there is nothing in favor of an oily preparation except that it produces a fairly painless dressing. The objection is that it is not as a rule sterile, and favors the growth of bacteria; it does not absorb the discharges but keeps them in contact with the wound, causing maceration, and must be changed every 24 hours. As opposed to oily dressings, lotions are advocated, and the one most favored by a large number of men is picric acid in 1 to 5% solution. In favor of such a dressing are the following points: It can be sterilized. The discharges are absorbed by the dressing. The growth of bacteria is prevented and hence lessens the subsequent danger of constitutional symptoms. The first dressing can be left on at least 48 hours, thus giving the patient a chance to recover well from his shock. The dressing is clean, is healing *per se*, and above all, acts as an analgesic. Poisoning is *not* a common complication, when the weaker strengths are used. Most men consider this danger of poisoning a negligible one, and the advantages of this dressing to far outweigh any possible danger of absorption.

With a view to determining the value of these two well-recognized forms of treatment, and particularly to try out the picric acid method, all burned cases receiving House treatment at the Massachusetts General Hospital for a period of one year from May, 1914, were given one of the two forms, *i. e.*,

(a) All cases going to the West Surgical Service were dressed with picric acid at the first and subsequent dressings until the danger of immediate sepsis was over and other forms of medication seemed advisable.

(b) All cases going to the East Surgical Service were given open air treatment immediately.

The results in our series place us in a position to say that the open air treatment for extensive burns is vastly superior to any treatment in which any kind of dressing is used. Cases so treated recover more quickly from shock, suffer less pain, and get a better start than cases receiving *any* kind of dressing. The fact that all of our cases that died under this treatment did so from primary shock as a result of extensive burns, within 6 to 72 hours after entrance, makes it impossible exactly to compare statistics of those two forms of treatment, but we are convinced that the case that is not traumatized by any form of dressing is much more likely to recover than the one less carefully handled.

Picric acid is by all means a superior dressing to any of the oily substances. We have seen no symptoms of poisoning. In first degree burns it leaves a clean, dry and probably sterile surface and relieves pain very quickly. In second degree cases it has proven a splendid dressing, leaving in a few days a dry surface, all discharge being readily absorbed through the dressing, and an area which practically never becomes septic and heals quickly.

During the past six months we have been trying out a series of cases on the tincture of chlorid of iron, and as far as we have gone we have every reason to look upon this as a satisfactory method,—certainly in burns of the first and second degree of not too great extent. It has the advantage that no dressing is required, but a light bandage may be used, if desired, simply as a protection. The tincture is simply sopped on over the burned area. This, in most cases of more than first degree burns, is painful at the very onset, but a state of analgesia very quickly supervenes; and after its first application, patients never complain again, but speak enthusiastically of the comfort and freedom from pain. Repeated applications should be made once an hour or so until the affected area is well coated over and a dry protective layer is formed. After this only occasional applications need be made. The area is best left uncovered, as a thorough drying is what is desired. In our series so far only first and second degree burns of moderate extent have been treated in this manner and the results have been very satisfactory. The area dries up rapidly because of the astringent properties of the drug; there is no tendency to sepsis, and healing takes place apparently with considerable more rapidity than with other forms of treatment, because a dry, clean area has been obtained, instead of the usual moist, warm, foul one, produced especially when oily dressings are applied. We believe this treatment is of distinct value in superficial burns of limited extent.

The Prevention of Sepsis.—This depends fundamentally on the kind of first dressing used. Burned areas are presumably at first sterile, due to the action of the heat, but they are immediately contaminated by the first covering of

dirty clothing or the first oily dressing. We have had no case of sepsis in either our open air or picric acid or tincture of chlorid of iron series. In all of our cases the skin surrounding the burned area is washed twice a day with alcohol, thus keeping the surrounding field as free from bacteria as possible. In the open air cases as soon as the area is crusted over, and sero-purulent material escapes, the crusts are incised or raised in order to allow free drainage, and the cleansing of the skin continued. Within about 6 to 10 days or less, warm salt solution compresses are applied to small portions of the crusted area and after 48 hours the crust is removed from this area, leaving a clean, raw surface, which soon begins to granulate.

We believe we can positively state, therefore, that sepsis can be prevented by the open air treatment, and the salt solution compress, cleansing of the surrounding skin, and avoidance of oily dressings at the onset.

We wish to lay particular stress on the early and painstaking and frequent pricking of the blebs, the incising of large crusted areas and the elevation of crusts to effect constant and proper drainage. To do this successfully a special nurse should be employed, and if done carefully and gently, very little discomfort is caused; toxic material is thus constantly drained off, the temperature is kept lowered and sepsis is much less likely to ensue. This must be done almost continuously to be successful and requires great patience and diligence, but the results obtained are worth all the extra labor expended.

3. THE PREVENTION OF CONTRACTURES.

From our observation of some 100 recent severely burned cases, we think we are in a position definitely to state that the percentage of contractures *can* be reduced at least 75 per cent. by three definite means. First, and most important, is the prevention of sepsis. Second, by the early immobilization of extremities affected by properly applied splints. This is most important and should be employed at the very onset of treatment, as soon as the case is over its shock and is running smoothly and *before* granulation begins. Third, by the early employment of passive motion and massage. In the hospital our cases are sent to the Zander department as soon as they can be moved, and treatment begins very gradually. Massage is applied to the skin immediately surrounding the burned area, and as much passive motion used as is consistent with comfort. This is done daily during granulation and afterwards till all signs of contracture have disappeared. After massage in the early stages, the limb is returned to its splint as long as that seems necessary, being taken out occasionally to rest the part. We believe that the above methods are of greatest value in effecting the early recovery to usefulness of these tedious cases.

To be successful, however, in the use of splints, they must be employed early and continuously and with great patience. Often, variously moulded plaster-of-Paris casts can be made to adjust to different parts of the body and to accommodate the dressed area, and are of the greatest service.

4. COMPLICATIONS.

Duodenal Ulcer.—The question of the incidence and etiology of duodenal ulcer in severe burns is yet an unsettled one. Just how many cases which have nausea and vomiting and epigastric pain within the first few days are developing duodenal ulcer is not possible to say. The fact that many of these are quickly relieved by dram doses of soda bicarbonate makes it seem unlikely that the symptoms are due to anything more then the toxemia produced by the burn. The percentage of autopsies on burned cases is so small that detailed statistics are not available. We have failed to find a single case of duodenal ulcer in any of the cases autopsied at the Massachusetts General Hospital since its foundation. Out of all cases of multiple burns coming to autopsy, 6 had either nausea, vomiting or pain in the epigastrium, but only three showed any pathology in the gastrointestinal tract. Most of these cases were in profound shock and lived but a few hours. One case in whom there were no symptoms (probably because of the degree of shock) showed two feet of upper ileum congested but no ulceration. One case with pain in the epigastrum showed at a point 125 c.m. above the ileocecal valve, intense redness of the mucous membrane with discrete and confluent irregular black-red areas but no ulceration. The cecum was even more affected but there was no sign of even minute ulceration. One case which vomited everything taken showed some reddening of the mucosa in the lower ileum but nothing in the region of the duodenum; and one case with slight nausea showed only the mucosa of the stomach mottled and the first portion of the duodenum red in color but no ulceration. We are therefore convinced, after a careful study and analysis of clinical and autopsy records,—taken in conjunction,—that actual duodenal ulcer following severe burns is so rare as to be practically negligible. We do, however, recognize a distinct train of symptoms strongly suggestive of this condition but which we believe are due to the toxemia as a general disturber of metabolism rather than as an exciter of distinct pathological changes in the duodenal mucous membrane.

The fact that these symptoms subside with proper treatment also suggests toxemia rather than actual lesion of the duodenum. It has been our experience that cases given dram doses of soda bicarbonate three or four times a day, together with a general forcing of fluids, recover quickly from the symptoms of toxemia. Certainly, physical examination of the cases shows none of the well-known signs of duodenal involvement.

5. PROGNOSIS, ACCORDING TO DEGREE AND EXTENT OF BURN.

A first degree burn of one-ninth of the body in a child is often fatal, while a first degree burn of two thirds of the body in adults generally results fatally. One third of the body area in second degree and much smaller areas in third degree are generally fatal.

Analysis of our series shows, however, that the prognosis is very variable and that young adults may survive even greater areas and recover rapidly, while young children and the old or feeble will often succumb to secondary shock with very slight and very small burns. The age and condition of the patient is of nearly as much prognostic value as the extent of burn, provided the burn is not of extreme extent or degree.

We have found that the more complicated methods of measuring the body surface, such as the use of Du Bois Height and Weight Formula Chart, are not practical, but that if one estimate the surface in the male as approximately 20 feet, and in the female as 16 feet, rough estimation of the extent burned can be made which is accurate enough for prognostic purposes. To know definitely whether one or two square meters more or less are involved is of little importance in comparison with a sound appreciation of the patient's general condition.

The mortality in this series was 23.4 per cent., which is about the usual mortality in this type of case. The mortality is higher when the chest, back, or abdomen is involved than when equal or even greater areas of skin are burned on the extremities.

The presence of shock is the most important factor in making the prognosis at the onset. Practically all badly shocked cases die, irrespective of previous condition or subsequent treatment.

A careful review and consideration of the evidence at hand in the study of cases of severe burns would lead us to the following general conclusions:

1. The three most important factors in the treatment of burned cases are:

(*a*) Prevention and treatment of shock.

(*b*) Prevention of sepsis.

(*c*) Prevention and treatment of contractures.

2. Many deaths have been caused by ill-advised attempts at a first dressing.

3. The form of first dressing is largely responsible for subsequent sepsis. Oily dressings should be avoided. Cleansing of the skin surrounding the burned area with alcohol aids in preventing sepsis. Constant drainage of discharges is essential.

4. The open air treatment is far superior to that in which any form of dressing is used.

5. Either picric acid or Tr. chlorid of iron are by far the best forms of medicated dressing.

6. Contractures can be prevented in 75 per cent. of cases formerly contracting, by the early use of properly adjusted splints and by early passive motion and massage.

7. Duodenal ulcer is a rare complication and can be almost discounted.

We would formulate the following general rules for treating burned cases:

1. Combat shock first.

2. Treat all shocked cases or those with extensive burns by the open air method or the temporary use of the hot bath.

3. Avoid oily dressings.

4. In burns of the extremities—if fairly extensive, but not requiring open air—use picric acid.

5. In all other burns use picric acid, Tr. chlorid of iron, or the more modern paraffin film treatment according to preference or experience.

PART II.

THE AMBRINE TREATMENT OF BURNS.

It is probable that most of us who have not been abroad since the war began, first heard of the ambrine treatment of burns through the lay press, especially in articles that appeared in the *Outlook*, describing the wonderful and surprising rapid regeneration of tissue—even of muscle and bone—after its use. Comparatively few of the men who have been abroad to do war surgery have actually seen it in use, and our knowledge of it today has been largely a matter of hearsay and conversational reports of a few men who have seen it used.

This preparation is a recent one invented by Le Docteur Bart de Sanfort, the news of whose work comes from St. Nicholas hospital, near Paris. Dr. Sanfort made a report of its use at the French Academy of Medicine a little over two years ago, but no detailed accounts of its composition, method of application, or reasons for its superiority have yet appeared in the foreign medical journals. A few scattered abstracts appeared from time to time in the *British Medical Journal* in 1916, but these added nothing to the lay reports. Efforts by several men to obtain the formula for its preparation have been evasively answered by the statement that the excellent product could now be obtained from the French representatives in New York for $6.00 the pound.

These facts do not, of course, put this preparation on a strictly ethical basis, and a certain amount of skepticism has naturally resulted.

With the object of getting some knowledge of the composition of this product before its general use was instituted, the Hospital obtained a pound of ambrine, which was given to Dr. Denis, our chemist, for analysis. It was found to contain, roughly, 90 to 95 per cent. of paraffin of a good grade, 5 per cent., more or less, of beeswax, a small amount of resin, probably some such product as eucalyptol, and an aniline coloring matter, enough to give it its peculiar gray-brown

hue. The melting-point was about 140° F. With this approximate analysis at hand, a substitute was then made up with the following composition:

Paraffin of melting point 52° C.	90%
Japan beeswax	5%
Spermaceti	5%

These were heated together at 150° for 30 minutes. No coloring matter or deodorant or disinfectant was added. This preparation has been used independently and alongside of ambrine in order to check up the results on both, and it shall be my aim to give you as fair and unbiased a report on these paraffin preparations as possible, based on a rather limited number of cases.

The method of application of either is as follows: The burned area is cleaned up very gently as far as possible, removing dead skin and traces of previous medication, and all blebs pricked near their bases but the cover not removed. The surrounding skin is cleaned thoroughly with alcohol and the part allowed to dry as much as possible, or drying is hastened by the use of a warm air blower. Meanwhile, the ambrine or its substitute has been heated on a water bath—the ambrine to about 140° F. and the substitute to about 130° F. This is then painted or sprayed quickly over the burned area and for about two inches over the surrounding healthy skin. Theoretically, the spray is the best, because it does not injure the delicate granulations present and can be blown into and fills up every minute depression of the injured surface; but practically, the gentle application with a flat camel's-hair brush about 1½ inches wide does not harm the injured tissues. If applied gently and quickly at this heat a thin, smooth film is formed over the burned area, which makes a firm air-tight dressing. A piece of sheet wadding a little larger than the burned area is then peeled apart so that a very thin layer only is left and this is laid over the area and a second coat of ambrine painted quickly over this. The part is placed on a splint to immobilize and prevent cracking of the ambrine film. It may be further covered with a bandage. This dressing must be changed at the end of 24 hours. Generally, enough serum or discharge collects to "float" the ambrine coating to some extent. It lifts off easily, and generally intact, as it practically never sticks to the burned part. The area is now washed gently with warm boric solution, dried with a blower and the preparation reapplied as before, repeating each 24 hours until the area is healed.

The first question that naturally arises is, "Isn't this substance, put on at 140°, painful?" The author can testify, from some limited burns made on his own person to test this point, that the application can be said to be but momentarily painful. A rather uncomfortable sense of extreme heat is produced at the very first moment of application, but the very minute the first coating is on this sensation quickly subsides and gives place to one of rather soothing comfort. There is a slight feeling of constriction or adhesiveness for the first few hours after the dressing is first applied, but after that no particular sensation is noticed. Patients who have had more extensive burns treated give evidence of the comfort of the dressing but do not allow that the first application of the hot wax is absolutely without temporary discomfort. It is not a painful dressing, and its removal is *absolutely* without discomfort of any kind. It certainly is remarkably painless in comparison with any of our older forms of dressing.

The second question which I think would naturally arise is, "Why does not such a dressing give a favorable chance for bacterial growth?" The answer is simply that it does not. A distinct odor is generally given off at the time of removal of the coating but this has a stale, musty sort of odor more than a putrefactive odor. None of the cases of burns of limited extent, *i. e.*, hands, feet, arms, etc., in our series has showed the slightest signs of sepsis.

The lack of sepsis has been one of the rather striking things about this treatment. Case 5 of our series is a very good illustration:

CASE 5. Miss M. received second and third degree burns of the backs and fronts of both lower legs between the knees and ankles. She treated the burns with strong sulpho-naphthol for two weeks before coming to the hospital and produced, in addition, a generous sulpho-naphthol burn of the skin for about two inches on all sides of the original burned area, which latter was covered over with a dirty, thick, leathery slough. The area on admission was cleaned up as much as possible with a chlorinated soak, ambrine was applied to the right leg and the substitute to the left. In 48 hours the slough had entirely separated from both legs, leaving a perfectly clean granulating area, except where the Achilles tendon was exposed on the left leg. This case, while not a favorable one for ambrine, proves its worth as a dressing which certainly does not favor infection.

The length of time necessary for complete healing is another important point.

Our first four ambrine or ambrine substitute cases were first and second degree cases and healed up in 9, 12, 8 and 14 days, respectively. Case 1 had enormous blebs and did not look as if it would be healed for weeks and yet at the end of 9 days presented a smooth, soft, red scar and no scabs.

The resulting scar in the very small number of cases we have had has been noticeable for its softness, smoothness and pliability. It never has scabs and does not seem to crack and bleed as readily as burned areas under other forms of treatment.

It may now be asked, "What is the reason for the apparently favorable results obtainable by this preparation? Is it chemical or mechanical?"

It certainly is not chemical in any sense that

original ambrine has some secret constituent which renders it superior to any paraffin substitute. For, so far as we could determine, the substitute cases did exactly as well as the ambrine cases, healed as quickly, were as comfortable, did not become septic, and left just as smooth a scar.

The effect of this preparation, therefore, must be purely mechanical in its action. It seems probable that this mechanical action is favorable, first, because it immobilizes the affected area; second, it is a sterile dressing; third, it makes an air-tight sealed dressing—which may possibly be the reason why it does not favor bacterial growth; and fourth, by its close adhesion to the part favors ingrowth of granulations while it discourages up-growth or heaping up of granulation tissue, to some extent like adhesive plaster on the sluggish granulations of a varicose ulcer; or it may act as a supporting framework for new granulations. I have a feeling that the very soft, smooth scar may be due in a large measure to the contact with the paraffin and, of course, to the absence of sepsis.

There is a considerable amount of experimental work being done with various paraffin preparations or films. The first article of value to appear was that of Sollmann, of Cleveland, who also objects to the secrecy in regard to ambrine and the American preparations which have recently appeared on the market, because of the difficulty of comparing results in known and unknown preparations. Sollmann has made simple preparations which could be imitated by any pharmacist and has avoided the use of any coloring matter, deodorant or antiseptic in order that they might be tested purely from a mechanical point of view.

Preparations were made up to test several factors: 1, melting-point; 2, fragility; 3, stretching quality; 4, pliability; 5 hardness.

After testing the above, the author states that the preparation and mechanical properties of a series of paraffin film mixtures suggests that the most important mechanical property of such films, from the therapeutic point of view, is their hardness. It is suggested that several degrees of hardness might possess advantages under different conditions. Surgeons using these paraffin preparations are urged to use simple combinations of known composition so that their results can be compared and improvements intelligently made.

This author found that ordinary paraffin, melting at about 53° C. (or 122° F.), appears to possess practically the same mechanical properties as the French preparation, and urged it as the standard of comparison.

The article is of clinical as well as pharmacological interest.

In a recent visit to the Angell Memorial Hospital for Animals on Longwood Avenue, I found the American proprietary preparation called Parrasine, made by the Abbott Laboratories of Chicago, and extensively advertised in the *Journal of the A. M. A.*, and elsewhere, was being used on burned animals with satisfactory results. The veterinarian there was convinced that cases healed more quickly under this form of treatment than with previous methods.

From my rather limited experience with paraffin preparations I can say that I have been converted from skepticism to a rather firm belief that this method of treating burns (certainly those of limited area) is a decided advance over other methods formerly employed.

Points in its favor are: It is not a painful dressing; it is easy of application and removal; it does not favor infection; it produces more rapid healing; it leaves a smooth, soft, pliable scar.

From the point of view of comfort of the patient alone it is a decided advance over any other form of dressing.

DISCUSSION.

DR. J. B. BLAKE, Boston: I should like to compliment the reader on his paper, especially in what he said and the way in which he said it. The subject of burns is an extremely important one, and it is altogether too often overlooked as an excellent subject for discussion at medical societies.

There was one single aspect which the reader did not consider, and that was the first dressing of burns at home, which comes before us now in the many lectures in first aid, and which it is worth while speaking of for a moment before discussing the paper as a whole. The old dressings which have been recommended have largely been oil of some sort, or flour or molasses. It seems to me it is time now to drop all these recommendations, even though we may be talking to the mothers who live in the poorer parts of the city. It is always possible now to get hot water, and salt, and usually bicarbonate of soda. I think we ought to recommend warm water (on a clean cloth) into which salt is put, or saleratus, in the proportion, roughly speaking, of a teaspoonful to the pint. This would be an infinitely better first dressing than either carron oil or olive oil or flour or molasses. I would recommend that in the first-aid instructions which are now being given all over the country.

In my experience with burns, so far as it has coincided in method of treatment, I agree entirely with Dr. Risley, particularly in the matter of not removing the first dressing when shock exists, which he has emphasized even more than I have in the past. Cases of extensive burns, especially in children, are probably doomed to death by unnecessary and interfering first dressings. If a carron oil or even a molasses dressing has been put on it is better to stay on 24 hours and take the chance of additional sepsis, rather than take the chance of increasing the shock, by removing it. I should go even so far as to question whether it might not be permissible to give paregoric to the child together with the first dressing. That is open to question, but if there is ever a time when paregoric may be used by the laity it is to combat the early shock in a child.

The second point I wish to mention is the fact that Dr. Risley reports burns, all of which, in a big hospital, have been assigned to a single service. The instant you make burns a subject of intensive study

by a single trained expert or a group of experts, your results will necessarily begin to improve.

My first knowledge of ambrine, beyond reference in the daily press, I got with Dr. Faulkner at an illustrated lecture given in Boston some months ago.

The pictures were misleading. They were supposed to prove that, under the influence of this mysterious drug burns healed more quickly than ever before. The burns had been subjected to routine treatment by a certain number of observers and had not been distributed widely through the various wards. As regards the pictures themselves, it seemed to me they were very highly colored—to put it mildly. The first pictures were taken before the burns had healed at all, and greatly emphasized and exaggerated the size and depth of burn. The subsequent pictures were subjected to every possible method of making them seem better than they were. Then there were a few pictures which represented absolutely denuded areas which were supposed to get better in a time which was absolutely impossible. We divided them into two groups, one group which exaggerated the burns and suggested results which were only approximately obtained; and the other which apparently gave pictures that could not possibly occur. It is not possible for cicatrization to occur over an area of 50 or 60 square inches in three or four days.

We have tried at the City Hospital the ambrine subsitute which Dr. Risley described. In some nervous children we had difficulty in applying it. In adults I believe it to be, on the whole, the best dressing I know, with the possible exception of one per cent. picric acid.

In regard to ambrine, another reason why the scars are soft is perhaps in the fact that there is so little trauma in removing the dressing. Taking a dressing soaked with secretion from the burns of the average child, is an extremely traumatizing thing, and it produces shock. Nurses believe they cannot do it without hurting the child. The resulting hemorrhage tends toward the organization of a scar which is thicker than it otherwise would be. The picric acid, so far as my experience goes, is the best routine dressing for burns. We tried it at the City Hospital some years ago at the instigation of Dr. Jonas, beginning with a saturated solution, which was altogether too powerful; the statistics of picric acid poisoning presumably refer to the use of a saturated solution. We diluted until we got to a one per cent. for the average adult and even one-half per cent. for children. Dr. Jonas tells me that after ten years of experience he has no reason to modify his judgment of picric acid, and he still believes it by far the best routine treatment of burns. He has his gauze made up in small packages not more than four inches square, folded and covered with paper; and the firemen and engineers are taught how to undo the paper packages and to place the contents of the package on the burn, allowing the paper to stay over it as a temporary first dressing, attaching it with adhesive straps. This can stay on 24 hours, and in some cases 48 hours. If possible, he leaves the different pieces of gauze in position for three to four and even five to six days, moistening them once in 24 hours. He seldom has to resort to skin grafting.

In civil hospitals, we are often compelled to resort to skin grafting and in so doing we use the Revidan grafts. We make the graft thicker than the original Revidan, placing it at intervals of perhaps one-fourth inch, and covering one square inch of a burn which may be twelve inches square. We can begin grafting earlier and shorten the course of the cicatrization a good deal, because it is not necessary in this method to wait until the entire surface of the burn is ready for grafting at once.

Dr. Jonas also suggested the outdoor treatment, and in cold weather the exposure to the electric light. He has found the use of electric light up to 60 and 80 and 100 candle-power, the bulbs being at a distance of 12 to 20 inches from the burned surface, to be extremely beneficial, drying up the burns if discharging freely and hurrying along the cicartrization, and unquestionably aiming toward a smooth and pliable scar.

The important points which I would emphasize are,—the substitution of alkaline first dressings for oil or oily substances; the special effort to reduce shock probably without removing the first dressing for 24 hours, the use of ambrine or 1% picric acid as a routine for a large majority of burns, and exposure to sunlight or electric light after 48 to 60 hours.

DR. J. M. BIRNIE, Springfield: I cannot add very much to this very excellent paper of Dr. Risley's, but I do want to emphasize one point which he has made, and that is the fixation of burns to prevent contracture, even going to the extent of putting on plaster casts, which we do. And also I can add a little testimony in the use of paraffin dressings. We have used them in several cases and I must say that I am very enthusiastic over them, both as to results and comfort to patients. We have not used ambrine. We have used a substitute which we have obtained at various drug stores. We have written for the following prescription put up at the ordinary druggists, and apparently it is the same preparation from each one:—

1 part oil of eucalyptus,
5 parts olive oil,
20 to 30 parts hard paraffin,
Balance to 100, soft paraffin.

I do not think the oil of eucalyptus is at all necessary but we put it in because it was in the original analysis. We have tried putting it on with a camel's-hair brush, and also with a sprayer. In the first few cases we used a Wondermist sprayer and afterwards we decided to use a little bit of an atomizer, heating up the solution, pouring it into a bottle, keeping the bottle in a pan of hot water. We spray it and then do not put the sheet wadding in the second application. We put on just one film of the paraffin substitute and put loose gauze outside. We do not find that we have sepsis nor do we find it always necessary to change the dressing every 24 hours. In some cases you can leave it on 48 hours, and along towards the end, even longer. We had one case where a man with oily overalls on backed into a flaring torch. He was burned from the waist to the ankles. The deepest burns were in the flexor surface and they were only more or less superficial on the extensor surfaces. That man had boric solution until he could get to the hospital, and then he was immediately treated with this paraffin substitute put on with a Wondermist sprayer. His burns have healed now and he made a wonderful recovery.

If you write for a simple prescription of that kind and an ordinary atomizer, any one can use the treatment.

TREATMENT OF OLD UNUNITED FRACTURE OF THE NECK OF THE FEMUR BY TRANSPLANTATION OF THE HEAD OF THE FEMUR TO THE TROCHANTER.

BY E. G. BRACKETT, M.D., BOSTON,
AND
MAY SUNG NEW, M.D., BOSTON.

[From the Orthopedic Department, Massachusetts General Hospital.]

No attempt is made in this communication to review the literature on this subject, or to discuss the various methods of treating this condition, for it has been thoroughly done many times. It will deal only with the old fractures of the neck of the femur, at a period from some months to several years after the injury, when there has already been absorption of practically the entire neck, and when the partly atrophied head consists only of the articular portion, not projecting beyond the acetabulum, and must be regarded somewhat in the light of a sequestrum. It can derive a certain amount of nourishment from the joint fluids in which it is bathed, and also some from the non-vascular fibrous attachment, when such exists, but this union to the head fragment is often found, on operation, to be slight, and hardly enough to be the channel of much nourishment, and the actual bleeding of the bone when it is cut seems to be always questionable. It surely is very different from the dead sequestrum, but it is also very different from the bleeding cut surface of normal bone. This nutritive defect of the head is one of the most important factors to be reckoned with in the attempts to procure firm union between two fragments so long separated, for we must bring about conditions sufficiently favorable for the fragment to become thoroughly living again. The principle in the treatment of this condition in the fresh cases, when nutrition is good, and in the long-standing, when nutrition is necessarily poor, must be radically different. The retention by nail has practically been discarded, as well as the use of graft for retention, as the atrophied head is too soft to withstand any force put upon it, for the purpose of retention or fixation. The use of the graft as a carrier or trellis for osteoblastic stimulus, unless a firm apposition is obtained, is nearly as futile, for the graft, once detached from its bed, becomes dead bone, one end of which is fastened into live bone and the other into a fragment of questionable viability. It is reasonable to expect that the first end should live, but it is expecting a good deal that this insert, which itself must be renourished from its attachment into the femoral shaft, can carry its regenerative power across the bridge between the two and into the old head, at least partly dead, and restore it to normal activity. On attempting to freshen the surfaces of the two fragments, it is necessary to hollow the femoral surface of the head, for there is usually not enough of the head to make a flat fresh surface without encroaching on the cartilage edge of the articular surface; nor is there enough left of the neck to fashion a convex surface which will protrude into the newly made concavity of the head; therefore, any attempt to appose these two freshened surfaces results in approximately placing a cupped or mushroom-shaped head on a flat surface of the shaft, with only the edges of the head, at the best, in contact. If the leg is abducted, the upward riding trochanter pulls the neck surface away from the head, and prevents the firm contact which is necessary for a strong bony union. If, on the other hand, the leg is placed in the position of extension, then the small graft or peg, driven into the head, too soft to be relied upon to withstand any degree of force, must be relied upon to withstand the strong upward thrust of the thigh muscles. The fact is, by these usual methods, a firm bony union in these old cases of fracture of the neck of the femur, ununited after a long time, is not at all common. It has been found difficult to look up the results of operation on the old fracture cases. The pretty constant failure to obtain a firm bony union has not been an encouragement to go through the experience of the long convalescence added to the operation. Twenty-four cases have been studied, among which are some for which I have to thank the general surgical services of the Massachusetts General Hospital for the privilege of using. Of these (24), one has a useful leg. This report is by letter; it is (4?) years since the operation. It has not been possible to get an x-ray, but the patient writes that his leg is strong and useful, and that he has no pain. The operation was freshening the surfaces, no peg or graft was used. The man was younger than the average in these cases, being in the thirties, therefore at a time when the bone repair is more active. This is the only case of this series in which a satisfactory result was obtained. Results such as these, combined with the fact that these patients are permanently out of commission for any activity, is sufficient reason for advocating active surgical measures, even if they are radical.

The method here considered treats the femoral head as if it were a real sequestrum. We know that an entirely dead bone becomes vitalized if grafted on to living cancellar bone, and this seemed to be a solution to the problem here. The details were as to where to place the old head, and how. The thrust of weight-bearing from the shaft to the head should be as direct as possible, and yet have enough obliquity to adapt itself to the weight-bearing plane of the acetabulum. To accomplish this, the head is placed on the inner side of the top of the sawed-off trochanter, and in this way the thrust is passed directly from the shaft to the head, so that there is little or no distraction strain in weight-bearing, and the head has its most favor-

able position for a restored function, to gain which some compromise must be made.

Independent of the ordinary surgical conditions which must always be considered in any major operation, there is one contraindication. Sometimes, after joint injury, particularly in the older people, there is found a distinct osteo-arthritic change, with thinning of cartilage, as well as the tendency to overgrowths. Under these conditions, a favorable functional result could not be expected, and this operation must not be advised.

Technic. The joint is best exposed by the inter-muscular route, between the tensor fasciae femoris and gluteus medius, by an incision from the anterior superior spine to the middle of the trochanter, turning downward, parallel to the line of the femur for a few inches—then starting again at the angle of the oblique and vertical positions of the first, a curved incision is carried backwards and upwards three or four inches. The tensor fasciae femoris and gluteus medius are separated, the muscle attachments on the outside of the trochanter are removed subperiosteally, or with a thin bone attachment, and the top of the trochanter removed so as to save the attachment of the gluteus minimus and pyriformis. These muscles are then all turned backwards and upwards, and the upper and anterior portion of the capsule exposed, to the edge of the acetabulum. The capsule is opened longitudinally to its fibers, on the upper portion of its anterior surface, saving the attachment of the Y ligament, if possible, but which, however, cannot always be done.

The capsule above the opening is then detached from the femur and retracted outward and backward; the trochanter cut off just below the level of the upper edge of the head, the inner portion rounded to correspond to the curve of a 1½ inches to 2 inches radius, saving the anterior and inner cortex. The outer portion is either cut off obliquely, or a wedge taken out, near the outer surface, allowing the outer cortex to be pushed inward. The free surface of the head is thoroughly freshened, covering this area, so as to make a corresponding curve, to the rounded top of the trochanter. In abduction of the leg, the convex surface which has been fashioned on the trochanter, is brought directly into the concaved head, and in this position is firmly held against it. In this way the femoral head with its freshened surface is placed directly on the freshened cancellar surface of the trochanter,—an ideal condition for the vitalizing union of the poorly nourished fragment. The head is not placed directly on the top of the trochanter, for this would not allow the best position in the acetabulum, but on the inner and upper sides, which gives to it a somewhat oblique angle, partly resembling its normal direction, but without the normal neck. The stitches are placed in the capsule, but not tied until the leg is put into position of abduction, and the head seen to be in the relation to the end of the trochanter which is desired, in order that this contact can be assured, and the position of the leg is then maintained until the plaster is applied. The stitches are then tied, the outer attachment of the capsule which has been freed is secured with the muscle attachment. The attachments of the gluteus medius and minimus, and pyriformis, are either secured to the outer side of the trochanter, or are inserted into the wedge-shaped depression, which has been made, in order to round off its upper and outer end. The wound should be tightly closed in layers, a plaster spica applied, including the foot of the affected, and the other leg, to the knee, and extending well up to the lower thorax on the opposite side from the operated leg. As a rule, the extreme degree of abduction is not required, and less inversion than in the Whitman method with the fresh fractures. This fixation is maintained for eight to ten weeks, fixation with an ambulatory plaster, but without weight-bearing for about two months more, and beginning weight-bearing with active motion at the end of this period. The ideal treatment would seem to be fixation by removable plaster at the end of the first eight or ten weeks, with beginning massage and gentle passive motion; but unless this can be carried out with very intelligent precision, the complete fixation is the safer plan. The bone contact between the two fragments cannot be made over the entire surface of the head, so that considerable bridging in of new bone is necessary, for which sufficient time must be allowed, and a change in the angle of union between the trochanter and head has been observed, after too early motion or strain. The motion must be brought back slowly, for the capsule must be partly newly formed and newly attached, and a considerable amount of flexibility must be developed before all of the potential motion can be expected. There is no diminution in the shortening, or at least not a practical amount, for there is too much adaptive contraction of all structures to allow any decided change in the relative position of the leg to the pelvis. A greater range of motion, however, is possible than might be expected, an entirely practical amount of flexion abduction and rotation results. The amount of this depends somewhat on the oblique position of the head on the trochanter, and on the rounding off of its overlapping portions.

The first case operated on in this series and by this method was in 1911. A man of thirty-five had sustained a fracture of the neck of the femur in a severe railway accident, one and one-half years previously. There was no union, and the man was out of commission. The attempt was made to freshen the surfaces and to bring the surface together in the usual method. The position of the trochanter, with the shape of the surface of the remains of the neck, combined with the irregular shape of the

surface of the head fragment, which had a large spur projecting downwards and backwards, made this impossible, and suggested this transplantation of the head as a compromise. The recovery was uneventful, and the man finally returned to work, and has been working steadily as a railway conductor for several years. Nine cases have been done, but seven only can be used as indicative of results, for two are too recent to be counted. One is just out of first plaster, at the end of ten weeks, and the leg is firm to any up-and-down motion, and the upward thrust has the solid feel, and the x-ray shows the head at an angle on the trochanter. The indications are of a good union, but the case should not be used for definite statistics. The others all have had firm union with strong weight-bearing, limited, but a practical amount of motion, with the same amount of shortening which existed before the operation.

The proceeding is a radical one, but the operation is one that is easily borne by anyone in reasonably good condition, provided there is no organic disease, and the recumbency in plaster is made more safe by the double spica, as it allows a considerable change in position. The very great deal of disability in those who still have a long working period ahead, and the prominence of the pain element, is indication for a reasonable although radical attempt to obtain a useful leg.

DISCUSSION.

Dr. C. L. Scudder, Boston: There is only one pleasure that is greater than hearing Dr. Brackett present this subject, and that is to see him operate, which I have had the opportunity of doing several times on cases of this sort. I think his paper is a distinct contribution to the procedures which the surgeon may have in this group of cases, because, as has already been intimated, and as we know from practical experience, these patients are practically helpless, chronic invalids, unable to get about.

Now, fractures of the neck of the femur, in my mind, should be regarded something after this fashion, and they really group themselves into two groups,—without any reference to the old classification which has to do with the capsule and which is of very little importance practically: into the impacted cases and the unimpacted cases. If the impaction is a good impaction, if there is a good position, we are all agreed, I think, that we should let that impaction alone, and that probably union will take place in a large proportion of cases. If the impaction is a poor impaction, that is, the kind of impaction in which there is great eversion or inversion, the question will arise, is the individual old or young? If it is an old person, with poor impaction, it is better to do as we would with a good impaction,—let it alone and treat the case by immobilization. If it is a young, active adult, I believe we are justified in gently breaking up that impaction and either reimpacting it by a blow over the trochanter, or replacing it in position with abduction according to the Whitman method.

With the unimpacted cases I think the situation is quite different. We have here the recent cases in which I believe we should use the Whitman method or the Cotton method. These are the unimpacted cases which you see soon after the injury, and we know that if the leg is put in the abducted position and extended, union will take place.

Then there are the old cases of unimpacted fractures which Dr. Brackett has spoken of,—and I believe that Dr. Brackett's operation which he has described, and the results of which we have seen, is a distinct contribution to this group of old unimpacted necks of the femur. We may use, if we please, the method of refracturing the neck, and we may simply lay open the joint, curette the surface and put the parts as nearly in apposition as possible; and hope that union will take place. Then we may do what has been suggested,—refracture these edges and put a graft of bone from the tibia through, and place the parts in as near apposition before putting the graft through as possible; and in a good proportion of these cases union takes place, but I am inclined to think it does not as often as supposed.

In the reported cases of Dr. Albee in New York, we should scan very carefully the kind of cases in which he has performed this operation, because, as I understand it, Dr. Albee is doing this operation in certain recent cases with obviously good results; but in the old ununited cases it is a question whether this grafting operation is one which will meet the conditions satisfactorily in the largest percentage of cases.

I believe that one great merit of Dr. Brackett's operation is that it is comparatively simple to do. It makes the weight-bearing come on the normal places. I think this is a distinct advance in the treatment of this particular group of cases.

Dr. Frederic J. Cotton, Boston: I agree perfectly with what Dr. Scudder has just said, and I think this operation helps us around a corner which we have not known the way about before.

I have done a good many of these operations which were extremely unsatisfactory, but I am not quite as pessimistic as Dr. Brackett is about the results. The fact is, however, we get bony union in only a small proportion of cases, and in the majority of cases we do not even get functional result. Dr. Brackett has shown us the way out of this.

The reason some of these operations have been so unsatisfactory is that we tried to restore the bone to normal length; whereas Dr. Brackett reconstructs a new bone without attempting to restore the length.

Dr. John D. Adams, Boston: I have one word of commendation I want to add. I surely commend the operation most highly as being a comparatively simple operation, as hip operations go; all of which are difficult.

My experience is based on one case which Dr. Brackett saw in consultation. She has been out of plaster now only about three weeks, and is about on crutches, of course bearing no weight; but apparently the union is firm, and the patient has a little less than one-half inch shortening where there was over an inch. This I considered a rather good result.

Spina Bifida and Allied Malformations. Based on an Operative Experience of 34 Cases.

By Torr Wagner Harmer, M.D., Boston.

I do not come here with indiscriminating enthusiasm and optimism, but rather with the

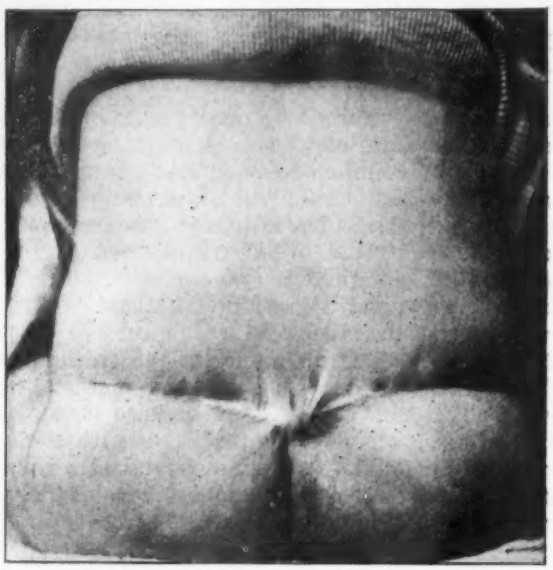
hope of casting a tiny ray of sunshine on a gloomy field of endeavor. There are certain conditions which we all generally regard as hopeless. It is true that not infrequently the condition is one which is inconsistent with life. It must be true, however, that there are other conditions which cause death because our methods are inadequate. It is needless to say that constant efforts to combat such conditions should be made. No matter how discouraging the work is, it should be done. In this way new methods have been discovered, which have greatly reduced the mortality of certain diseases so that these diseases today, although dreaded, are not regarded as hopeless, and some not even greatly dreaded.

In short, we should hold before us the words of Cicero, *"Dum anima est, spes est."*

One condition in which the prognosis is very bad is spina bifida. Fortunately, it is a comparatively rare condition, and therefore any systematic study and efforts to remedy can best be carried out at a hospital, and best by permitting one member of the staff to do all cases of this nature. I appreciate the courtesy shown me by the other members of the Surgical Staff at the Children's Hospital in permitting me to see and operate all the cases of spina bifida and allied malformations during the past twenty months. This constitutes a series of thirty cases. To these I add a case operated at the Boston Lying-in Hospital, and three others done in private practice.* This is a total of thirty-four cases, which I believe is an unusual experience; too small to deduce statistics of any nature, but ample enough to furnish a few points in operative technic. In fact, the earlier hard cases took me three-quarters of an hour to one hour, whereas now similar cases take but twenty to twenty-five minutes, and simpler cases I have done in ten or twelve.

As you know, spina bifida is a defect in closure of the neural canal of one or more vertebrae. This defect may be anterior or posterior. It may concern the cervical, thoracic, lumbar or sacral portion of the spine, or in a broader embryologic view the mid-line of the skull from the nasion to the foramen magnum. There may or may not be protrusion through this defect. Whether there is protrusion or not, the defect may be covered by skin, subcutaneous tissue, and membrane, or by membrane alone. The covering may be intact, or ulcerated, or ruptured and leaking without obvious ulceration. Over the defect the covering may be flat, or rounded and sessile, or rounded and pedunculated.

When a protrusion exists, it may contain only cerebrospinal fluid (*i. e.*, a meningocele), or it may contain nerve elements and cerebrospinal fluid (*i.e.*, a hydromyelomeningocele or a hydroencephalocele), or it may in the head contain only brain over which is tightly drawn some abnormal investment without fluid (*i. e.*, an encephalocele). The nerve elements may or may not be adherent to the sac. The function of the nerve elements may or may not be disturbed. There may, however, be complete sensory and motor paralysis. For example, a spina bifida in the lumbar region may be associated with paralysis of both legs, bladder, perineum, and rectum. There will be incontinence of urine and feces, and perhaps prolapse of the rectum.



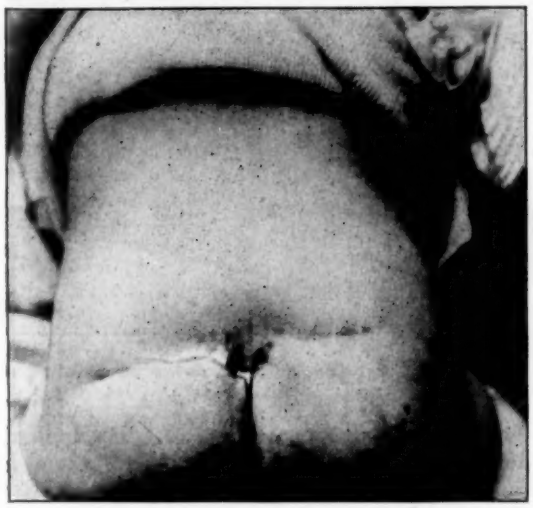
CASE 4. Myelomeningocele sixteen months after operation. Small keloid-like thickening at centre of scar. At operation, twenty-four hours old, with leaking sac of skin and membrane six centimeters in diameter and paralysis of feet. Paralysis cured.

It is needless to say that the most favorable type for operation is the meningocele which is covered with intact skin, and that the simplest, from operative point of view, is the pedunculated meningocele which is covered with intact skin. In these cases, after exposing the neck of the sac, it may be found very small, permitting simple ligation. In placing such a ligature, let me caution that it be placed not too tightly. This may cause sloughing and subsequent leaking of cerebrospinal fluid. Where post-operative leaking occurs, it rarely ceases, and death usually ensues from loss of cerebrospinal fluid or from meningitis. Let me caution also that an ample fringe of sac be left lest the ligature slip. It is needless to say that in cases with sloughing sacs the danger of post-operative meningitis is increased. That it does not necessarily occur is well shown in this series. Twenty-two of the thirty-four cases had ulcerated or leaking sacs, and nine survived operation, *i. e.*, 40%.

The incision has been an elliptical one, skirting close to the membranocutaneous border in those cases which were wholly or partially covered with membrane. There were but six cases covered entirely with skin, twenty with skin and membrane, and eight entirely with membrane.

* Another case had been operated upon three days before the reading of this paper. This case, therefore, was not included in the original paper but has been added in this writing.

In all cases in the lower lumbar and sacral regions, a transverse elliptical incision was practised, whenever possible, in order to bring the closed wound as far as possible from the anus. In some cases in this region in which the longitudinal diameter of the defect exceeded the transverse diameter, a vertical elliptical incision had to be made. This is more often the case in sacs entirely covered with membrane, especially the flat type.



Case 5. Myelomeningocele. Fifteen months after operation. Small naevus persists at centre of scar. At operation, thirteen days old. Sac covered with skin and membrane, and ulcerated and leaking. Incontinence of urine and feces and prolapse of rectum. Prolapse cured. Increasing control of bladder and rectum.

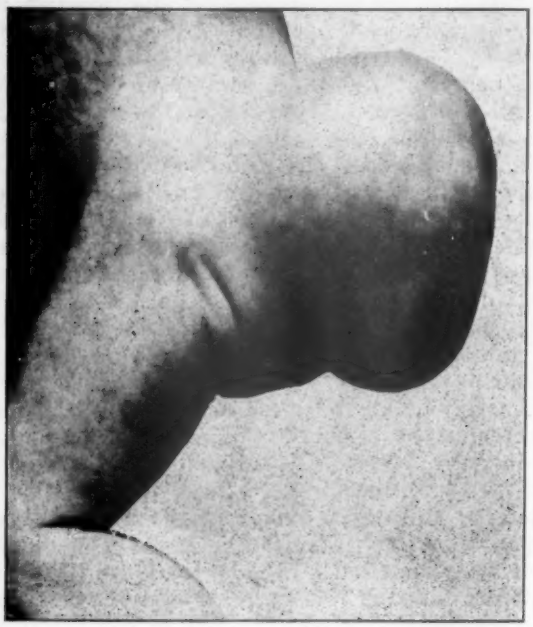
This series includes 7 meningoceles, 23 myelomeningoceles, 3 hydroencephaloceles, and 1 encephalocele. Twenty-three were rounded and sessile, 8 rounded and pedunculated, and 3 flat.

In operating on the rounded sessile type, an unexpectedly tiny communication of the sac with the neural canal may be found even in large tumors. On the other hand, although the communication between the sac and the neural canal is usually small in a pedunculated mass, it may be quite wide, occupying practically the whole pedicle. In pedunculated tumors, the consistency of the pedicle, whether firm, or soft and fluctuant, avoids surprises regarding the size of the neck of the sac. A pedicle of firm consistency probably contains a narrow neck of communication with the neural canal, surrounded by fatty tissue. A soft, fluctuant pedicle, on the other hand, probably consists almost entirely of communicating neck, with very little surrounding fatty tissue. In any case, the dissection down to the neck of the sac should be made carefully. Once the line of cleavage between the sac and surrounding tissues has been determined, the dissection may be rapidly continued circumferentially. With the sac well exposed about the laminar defect, it is best opened high on one side. The opening is cautiously enlarged to expose the interior of the sac. The opening is then extended around the sac caudad, avoiding nerves, and leaving an ample fringe of sac for closure. When the lower pole is reached, an effort is made to strip the nerves off the under surface of the sac with small moist gauze sponges from below upwards. I have found this direction easier than from side to side or from above downwards. In case the nerves can be stripped away, the dura is then closed with mattress sutures of No. 00 plain catgut. I have found that closure with mattress sutures offers greatest security against subsequent leaking. The most difficult problems in closure are offered by the flat type entirely covered by membrane. Inasmuch as this membrane has been a surface covering, I think that no part of it can be safely used for closure. The surface portion must be removed and not infolded under skin flaps. Obviously, in wide defects wholly covered with membrane, it may be impossible to close the dura after removing the surface covering. I believe operation in such cases should not be attempted. I have tried splitting the surface covering into an inner and outer lamina, preserving the former for closure. It is almost impossible to accomplish without buttonholing, which means leaving a minute portion of the outer cover or contaminating the inner lamina. Both cases have died of meningitis.

In narrower defects wholly covered with membrane, removal of the surface covering may leave dural fringes apparently too short to cover the canal. By carefully separating this investment for a little distance from the inner surfaces of the remaining portions of the laminae, closure may be effected. The dural canal is consequently made a little narrower in this region, but this may not be harmful in the region of the cauda equina. It is probably undesirable in the region of the cord.

I wish to emphasize a departure from the usual technic. In no case in this series has the laminar defect been covered with flaps of fascia. If the bony defect is caused by hyper-activity of the choroid plexuses and ependyma before bony closure of the neural canal has occurred, the success of the operation does not depend upon building up a barrier against the bony defect, but entirely on the subsequent activity of these tissues. If these have reached a stage of normal activity (*i. e.*, recovered from an early tendency to hypersecretion), then no further bulging will occur. With these premises, fascia covering is unnecessary, and the operation is appreciably shortened by omitting this step. This is very important in infants.

If the choroids and ependyma have *not* recovered from a tendency to hypersecretion, then closure with fascia, I believe, will not be effective against the increasing pressure. What occurs in such cases is not bulging at the site of operation but hydrocephalus. In only one case in this series have I seen bulging at the site of operation, and in this case there was also postoperative hydrocephalus. In no other case of



CASE 27. Myelomeningocele. Three months old.

CASE 27. After operation. Well seven months later.

continued hypersecretion after operation as shown by hydrocephalus (and there were five) did bulging at the site of operation occur. I do not regard the covering of the defect with fascia, therefore, as necessary. It may be desirable as a subsequent protection against traumatism for a weak spot. It is, however, time-consuming and increases the possibilities of infection in cases with ulcerated sacs, for the mobilization of the fascial flaps may be followed by oozing and collections of serum.

Closure of the skin without undue tension may require extensive dissection of skin and subcutaneous tissue from the fascia, even up to the lower angles of the scapulae, down over the ilia, and well into the flanks. Even then undue tension may occur at the center, but can be greatly lessened by hyperextension of the back. To accomplish this, the baby after operation is placed belly down with the pelvis and legs elevated.

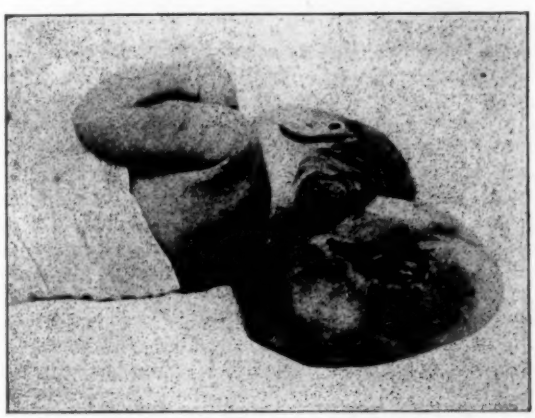
Paralysis. Twenty cases exhibited some degree of paralysis. Of these, the paralysis was increased after operation in three, it was not affected by operation in nine, and improved or cured in eight. In five of these eight the benefit was unimportant, for all died subsequently of acute hydrocephalus or meningitis. However, the paralysis which they exhibited before operation was lessened or disappeared up to the time of death. Three of these cases are still living. One, Case 5, exhibited prolapse of the rectum and incontinence of urine and feces. Now, fifteen months later, there is no prolapse, and the mother is convinced that there is increasing control of bladder and rectum. Another case, Case 8, exhibited sensory paralysis of both legs, motor paralysis of right foot, and prolapsed rectum before operation. The motor paralysis of the foot and the prolapse are cured but sensation in the legs is still impaired. The third case, Case 4, presented a myelomeningocele in the sacral region, with leaking sac and paralysis of both feet when seen twenty-four hours after birth. Operation was done at once and the child is perfectly well sixteen months later.

Paralysis, therefore, cannot be due in all cases to nerve destruction. In some cases it must be due to the stretching of nerves which have become adherent to the summits of enlarging sacs. If operation is done before such stretched nerves become hopelessly incorporated in granulations at the summit of the sac, they may be freed from the sac and the paralysis cured. It is true that there may be defective development of the cord and nerves. In such cases an apparently satisfactory operation may fail to cure the paralysis. Such a condition, however, cannot be determined without operation, and it is no argument against early operation on cases with paralysis. By operating on paralyzed cases at once, nerve destruction may be forestalled and cure made possible.

Sixteen cases were discharged dead, eighteen cases were discharged alive; a mortality of 47%. Although high, it compares very favorably with percentage figures which I have found. I have seen figures giving the mortality as 75% and higher. The causes of death were shock, one; acute hydrocephalus, one; continued loss of cerebrospinal fluid, four; umbilical septicemia, one; meningitis, nine. Therefore, deducting the case which died of umbilical septicemia, the operative mortality is 44.1%. When I consider that 64.7% of the cases exhibited ulcerated or leaking sacs, I am not ashamed of this mortality. Of the cases discharged alive, four exhibited some degree of paralysis, three increasing hydrocephalus, ten were well. Of

the well cases, three were myelomeningoceles, all with ulcerated or leaking sacs; four were meningoceles with intact coverings; and four were encephaloceles.

Berger has told us that brain inclusion in an encephalocele is abnormal brain tissue which he called cephaloma. He told us that this was non-functionating and insensitive. In these four cases I have amputated the brain protrusions thrice with the knife and once with the cautery, apparently without ill effect. Two brain inclusions were the size of small crab-apples, one the size of a walnut, and one the size of a kidney bean. The three hydroencephaloceles were all occipital, one the size of a walnut, one the size of a plum, and another larger than the child's head and ulcerated (Case 14). All of these children are living and well. The fourth case of this group was a pure encephalocele the size of a small crab apple, covered not at all by skin but by a tightly fitting investment of modified meninges in a child twenty-four hours old. This child was obviously an idiot and, without anaesthetic, the mass was amputated with the cautery flush with the skull. It apparently caused no discomfiture. It was thought that the procedure would terminate the misshapen little creature but she made an uneventful convalescence. I have since learned that she fortunately died three months later of pneumonia.



Case 14. Hydrocephalocele with ulcerated sac. Eighteen hours old. Brain inclusion size of ping pong ball. Amputation with knife. Well one year after operation.

The coverings of bifida sacs may be entirely skin, entirely membrane, or partly skin and partly membrane. The sacs are subject to injury. The injury may cause abrasion or immediate rupture. If abrasion occurs, it is prone to infection. Sooner or later, with or without leaking of the sac, the infection will penetrate the sac and meningitis and death ensue. If immediate rupture occurs, sudden death from sudden severe loss of cerebrospinal fluid may result. Rupture, however, may lead to death by furnishing a portal of entry for infection. It is obvious, then, that the prognosis is much worse in cases with sacs covered with membrane than in those with sacs covered with skin. The membranous cover is so apt to become infected that I believe we will all agree upon the wisdom of early operation. How early? My own feeling is that operation should be done as soon after birth as the child can be transported to surroundings suitable for operation. With a little practice in infants the worse cases can be completed in twenty to twenty-five minutes, the simpler ones in ten or twelve. I strongly advocate operating at once after birth in cases with sacs covered with membrane. By "at once," I mean within three, four, or five hours after birth. Although the large majority of cases in this series (64.7%) had infected oozing sacs, a few recovered from operation. The majority died of meningitis. I am convinced that the mortality would have been greatly reduced had these cases come to operation before ulceration and infection occurred. I have seen cases only a few hours old with ruptured sacs, and others no older with granulating and oozing sacs. Hours are important under such circumstances. In cases with ulcerated or leaking sacs operation offers a tremendously greater chance of success, if done at once. In cases with sacs covered with intact skin, operation may be deferred, but should not be long deferred in the presence of paralysis.

DISCUSSION.

Dr. John J. Thomas, Boston: This paper of Dr. Harmer's shows a large amount of careful work, and I can only commend the things he said to you. I shall not give you a long neurological discussion in regard to spina bifida, but I do want to emphasize one point to which he referred, and that is the fact that probably the best theory of the cause of spina bifida is the increased pressure of the cerebrospinal fluid before birth, that prevents the closure of the bony arches. The effect of that is the thing to which he has called attention, namely, that we see frequently hydrocephalus in connection with this. I have seen a great many of these cases that did not show the hydrocephalus at the time of operation, or even very soon after, developing rather slowly later on. This is not in itself a contraindication for operation. I think, however, it is a point which we would all do well to emphasize in our prognosis to the parents, that back of this condition is probably an increased production of cerebrospinal fluid, and if not overcome the child is very apt to develop hydrocephalus. This, of course, complicates the prospect of life and the chances of future health, if they do live.

Unfortunately, as you know, we have no very effective treatment for hydrocephalus. The giving of iodide, in my experience, is of very little use. The ventricular tap through the corpus callosum is very effectual in keeping it down, but this has to be done very frequently. The whole of the cerebrospinal fluid is probably replaced within six hours, so that in a severe case there is very little hope of maintaining the lower pressure for any length of time. The giving of thyroid extract, which Fraser has suggested, I have found to be of considerable apparent benefit in cases of hydrocephalus. I should advise men who operate on these cases for spina bifida to give thyroid extract in small doses

suitable for infants, very soon after the operation is done.

Of course, in cases where there is danger of ulceration of the sac we have no choice as to the time of operation. It has to be done, and has to be done promptly, and it is much better done before the ulceration takes place. Dr. Harmer's results are fully as good as any of the others of which I know. The high percentage of failures is due not to the difficulty of operation, but the difficulty of avoiding infection, and getting firm union, and preventing leakage of cerebrospinal fluid when operating through infected areas.

The important point, from a neurological point of view, in doing these operations, I think, is to exert care in dissecting your sac out to see whether the nerves run into it. These cases, you know, are very much more frequent in the lower sacral region and the lower lumbar region than higher up. In the dorsal region, if you have paralysis, you have a defect of the spinal cord, and it makes no difference whether you remove the sac or not, your defect in the spinal cord will persist. In the lower lumbar or sacral region, if you save the nerve roots you may prevent paralysis or have improvement in paralysis. If you cut them you will produce paralysis, and this may be not from disease alone. If the nerve roots do not go into the sac, your precaution is unnecessary, and you have wasted time in trying to prevent a complication which was not likely to occur. It is very distressing when you find a child has no paralysis, and the operation is advised for the sake of having the child cared for more easily, to see it develop a paralysis because the nerve roots have not been separated. On the other hand, it is very frequent that the nerve roots run into the sac but do not run out into the nerve trunks, and the saving of them makes no improvement in the paralysis. Then you simply have a condition which you cannot remedy.

The question of the suturing of these nerve roots I think is entirely impractical. It might be done in adult life, but in a child, where it is a developmental thing, there are lesions behind these roots, and the nerve roots themselves are defective.

In regard to stimulating by electricity and dropping the sutured nerve back into the spinal canal, I think it is practically a hopeless thing. I should be glad to see some surgeon attempt it where the electrical examination gave any encouragement for doing so. The thing practically never seems to be carried out, but it should be thought of, and certainly one should always look carefully on the inner side of the membrane of the sac for the nerve roots and try not to cut them.

One other point is the fact that in all these cases of defects of the cauda equina you must remember your paralysis is of the peripheral type where we have destruction of the peripheral motor neuron, and therefore these paralyses are always of the flaccid type, with relaxation and atrophy of muscles. That was shown in one of the photographs by the lack of development of the buttocks of the child. These cords are both sensory and motor and so you have defects of sensation.

In regard to spina bifida occulta, the condition is often overlooked. If one remembers that invariably with spina bifida with paralysis you have sensory losses as well as motor, such mistakes would be more easily avoided. Remember, too, in your diagnosis that not only is the sphincter affected, in the severe cases where there is prolapse of the rectum, but where the anus is simply relaxed you can determine whether there is nerve defect before operation by looking to see whether you get the anal reflex. Prick the skin of the perineum with a pin and see whether the sphincter reflex is present. Your statement to the parents that there is nerve defect already present will save a good deal of difficulty in explaining afterwards, in cases where the trouble with the rectum persists and proves to be a troublesome and distressing symptom.

DR. J. S. STONE, Boston: Dr. Harmer has tackled a most discouraging subject and he has obtained wonderful results in many of his cases. If he follows his cases for another ten or twelve years, however, his results will not be so good. In these cases, as I have followed them along, the primary result may be good, but sooner or later, with the paralysis of the sphincters there is lack of control of the urine, and with it more or less paralysis of the bladder with residual urine, and ultimately death from urinary infection.

This is one of the discouraging things that will happen, but is not a contraindication to operation.

Another thing which Dr. Harmer stated perfectly frankly was that he operated at first on all cases. I think that everyone who does much of this work will sooner or later come to recognize that certain cases had better not be operated on. That is, not from any selfish point of view, but there is nothing to be gained; and I think that all of us must recognize that it is harmful to surgery to do operations in which nothing can be gained. We must also recognize that in all probability there will never come a time when anything can be gained in some of the more severe cases.

Dr. Thomas spoke of spina bifida occulta. There is a group of the anterior spina bifida cases that do not have any tumor which shows posteriorly. There are a great many which come into the hospitals and are under the observation of the most careful men in whom the true condition is not thought of. In any case where there is either retention of urine or incontinence of urine, which is not explained, spina bifida occulta is always to be thought of. That condition can be practically diagnosed without an x-ray from those conditions, if there is any abnormal irregularity to be felt in the spinal column posteriorly, if there is a median line lipoma, or if there is a localized area of exaggerated growth of hair over the spine. By this I mean a diamond-shaped area of hair, say an inch and a half long, in any part of the spine. With any localized paralysis or any hitch in the gait, spina bifida occulta is something which is always to be thought of. Of course, the condition cannot positively be diagnosed without an x-ray. In some of the cases of spina bifida occulta where the tumor is in the thoracic region, and where there may be a large tumor, I have known of the diagnosis of asthma, from the difficulty of respiration. The particular case which I have in mind had an enormous spina bifida occulta which practically filled one side of the chest, which had been tapped repeatedly.

In regard to operative procedures, the chief danger is the danger of meningitis, and meningitis may occur either with or without operation. Meningitis may occur through a membrane that is practically intact, without any definite leakage.

That I have seen repeatedly. And we do not want to confuse leakage of cerebrospinal fluid from the spinal canal with the little droplets that will appear in the upper central part of the ulcerated area, which come from the open central canal of the cord. Where there is an ulcerated area, if you look carefully in the median line toward the top you will almost invariably see a minute hole, and if you watch it long enough you will find a little droplet oozing from that as sweat comes from a sweat gland. If you figure the thing out you will see how the hole comes there embryologically.

There is a definite danger of death from meningitis after operation, and also the danger of death from sudden leakage. If the utmost care is not taken through posture and in every way to prevent excessive leakage at the time of operation, the results are, within twelve hours, an excessive rise of temperature. For instance, it may happen in a case operated in the morning, that in the evening the temperature may go to 106° or 110°. Then there is the danger of leakage around stitch holes, which not necessarily always, but sometimes, adds tremendously to the danger of death from meningitis. The third danger is the danger of hydrocephalus. When we take away the spina bifida in many of these cases we take away the safety valve. The operations which have been devised for the cure of hydrocephalus are operations which try to bring the cerebrospinal fluid into communication with a large area of fat, whether subcutaneous fat or retroperitoneal fat. Where we have a spina bifida we have that condition existing. We have the meninges coming out, spreading out, and lying in contact with this large area of subcutaneous fat, so that there is that safety valve. There is a chance for the cerebrospinal fluid to pass out from this big tumor into the subcutaneous tissues, and there is a balance struck between the secretion and the absorption back again into the subcutaneous tissues from the spina bifida; and when we cut off the spina bifida we take away the safety valve, and the head fills up.

I agree absolutely with Dr. Thomas that we must use the utmost care in saving any nerves that we can. And in answer to Dr. Harmer's question, I would say that I personally have not any one method of choice, but I believe in simply saving them in the best way possible, and I think usually the best way is to open where there are no nerves, and then work from the inside, rather than trying to work from the outside, because we can see better on the inside than on the outside.

I think Dr. Thomas emphasized one point which is very important, and that is, always look at the perineum. Whenever there is any paralysis it is bound to show there. It may show elsewhere, but always in the perineum.

REPORT OF RESULTS OF RADIUM TREATMENT AT THE COLLIS P. HUNTINGTON MEMORIAL HOSPITAL BY THE CANCER COMMISSION OF HARVARD UNIVERSITY.

BY WILLIAM DUANE, PH.D., BOSTON,
AND
ROBERT B. GREENOUGH, M.D., BOSTON.

THE treatment of cancer and allied conditions by radium has now (June, 1917) been in operation at the Collis P. Huntington Memorial Hospital for a sufficient length of time to permit conclusions with regard to its value to be formulated. Radium was first employed here in September, 1913, and from that time to the present day has been the main interest and activity of the clinical work carried on by the Cancer Commission.

The chief responsibility for this work must be accorded to Dr. J. Collins Warren, Chairman of the Cancer Commission of Harvard University. Dr. Warren early saw the necessity for an independent and unbiased investigation of the value of the many therapeutic agents advocated from time to time as "cures" for cancer, and it is due entirely to his wise foresight, his unlimited enthusiasm, and his untiring effort that the hospital was established, and the clinical work of the Commission begun on a broad basis of scientific accuracy, and with resources sufficient to maintain these standards. During this period a number of different individuals have taken a part in the work, but owing to the very complete system of records and clinical notes established by the first Physician-in-Charge of the Hospital, Dr. Thomas Ordway, the data obtained are now available for study, and the results can be accumulated and stated with a considerable degree of accuracy. The hospital was opened during the period when Dr. E. E. Tyzzer was Director of the Cancer Commission, and he took a large part in the organization of the work, as well as the more definite responsibility for the pathological work, the reports of autopsies and the examination of clinical pathological material. The work with radium began in September, 1913, with the appointment to the Commission of William Duane, Ph.D., Research Fellow in Physics. Dr. Duane has had charge of the preparation and measurement of the radium, and of the details of its practical application to treatment of the cases adjudged suitable for radium therapy. In addition to Dr. Tyzzer, Dr. Ordway and Dr. Duane, a number of others have had a share in the collection of the data on which this report is based: Dr. Ellis Kellert and Dr. George Benet, resident physicians; Dr. Henry A. Christian and Dr. Francis Peabody, consulting physicians; Dr. J. Lucien Morris, Dr. F. S. Hammett, Dr. Henry Lyman, chemists; Dr. W. J. Kerr, Dr. Carl T. Harris, Dr. Clarence T. Hyman, house officers; Dr. Edward H. Risley and Dr. Channing C. Simmons, assistant surgeons; Dr. George A. Leland, Jr., Out-Patient surgeon; Dr. A. A. Ghoreyeb, Research Fellow in Pathology; Miss Irene W. Mason and Miss Anna Gibson, matron-superintendents of the hospital; and many consultants in special lines of clinical work, including Drs. Harvey Cushing, C. A. Porter, D. Crosby Greene, Harris P. Mosher, E. A. Crockett, W. P. Graves, George Derby, C. J. White, as well as Dr. Robert B. Greenough, Surgeon-in-Charge of the Huntington Hospital. All of above-mentioned persons have in some degree contributed to the accumu-

lation of the material upon which this report is based.

The present organization of the hospital work is as follows: A patient is referred to the hospital by his own physician, or by another institution. Application cards are furnished with blanks for the principal data which it is desired to obtain. The patient is then examined with a view to the diagnosis and the question of whether or no radical operative treatment is a possibility. When the opinion of a consultant is needed the services of the members of the different departments of the Harvard Medical School are freely called upon, and have been most generously given. With the exception of certain minor superficial lesions of the non-metastasizing type, it has always been the policy of the hospital in operable cases, to advise operation, and to withhold radium or other non-operative treatment. If operation is considered advisable the patient is referred to one of the larger hospitals, or returned to his own physician with this opinion. A few cases have been received at the Huntington Hospital for radical operation, but they are taken only for special reasons, and are the exceptions to the general rule.

Pathological reports in confirmation of the diagnosis of cancer are sought in every case. In the cases of post-operative recurrence of cancer, the pathological report upon the tissue removed at operation can usually be obtained. In advanced inoperable and ulcerated cases, a fragment of tissue to confirm the diagnosis can usually be secured with the curette, without undue danger of spread of the disease. Where the tissues are unbroken, however, it has been the policy of the hospital to refrain from employing the exploratory excision of fragments of tissue, on the ground that the danger to the patient of artificial spread of the disease outweighed the advantages of a certain diagnosis. This rule has been broken, advisedly, from time to time, but only on rare occasions.

If the case is one which is considered suitable for radium treatment, the matter is discussed with Dr. Duane; the details in regard to dosage, screening, distance, duration and frequency are determined, and treatment is begun. Special methods of application are devised for special cases, and the progress of the case is followed both by the radium expert, and by the surgeon. Data, consisting of measurements, photographs, tracings, etc., are made, and the record is continued. No case is discharged "cured" or otherwise, until terminated by death. A follow-up system, under Miss Ruth Symonds, the Social Service Worker of the hospital, has yielded excellent results in tracing up "lost" cases. From April, 1912, till January 1, 1916, out of 1080 cases, the end-results (to within six months) were known in all but 39.

It has been the policy of the hospital to restrict the use of radium to patients that could be brought to the hospital to be cared for by the staff; only in this way can the full benefit of the radium be secured to the patient, and the full benefit of the data obtained secured to the Commission.

In reporting the results of the use of radium in the treatment of cancer, some preliminary statements are advisable. When the first reports of the therapeutic use of radium were given out, a lapse of time sufficient for an unbiased and definite conclusion as to its benefits had not occurred. In certain clinics, also, the customary data for the surgical diagnosis of malignant disease in its different situations were not always obtained, and evidence in support of the statements that the cases treated were actually cancer was not provided. The sensational publications in the lay press relating to the wonderful effects of radium therapy, and the dramatic and interesting physical phenomena of radioactivity, all helped to rouse in the public, and among the profession at large, an expectation of brilliant results far in excess of what the facts now actually seem to warrant. Again, the obviously extravagant claims of some of the earlier exponents of radium therapy served to arouse in the more conservative members of the profession a natural pessimism, which led them to distrust its value altogether. As a fact, the real truth lies somewhere between these two extremes. Radium is not a cure for all kinds of cancer. There are many cases of cancer in which it can be said to be of no material benefit; but there are also many cases where its use prolongs life, relieves distressing symptoms, improves the general condition and the functional activities of the patient, and mitigates, as does no other agent which we have employed, the gradually progressive symptoms of advancing incurable cancer. There is a small group of cases of cancer where treatment with radium has apparently, so far as our observations extend, been capable of eradicating the clinical manifestations of the disease. It would be premature to use the word "cured" in this connection, as the time elapsed is not sufficient to conform to the arbitrary three or five year limits commonly accepted in surgical literature, which are admittedly themselves time standards too brief to cover the infrequent but well-established cases of late recurrence. This group of cases includes the more superficial and less rapidly metastasizing forms of carcinoma, together with a few cases of the deeper and generally more serious types of disease which appear to be, for some unknown reason, individually more susceptible to radiation than the usual cases of the same character. In the large group of cases in which radium has marked beneficial effect as palliative treatment, and in the smaller group in which its effects are more permanent and complete in eradicating the clinical signs of the disease, radium has already justified the very considerable outlay necessary for its purchase, and the further difficulties and dangers of its effective administration.

The 1080 cases included in this report are those which entered the hospital in the twenty-eight months from April, 1912, to January, 1916. Radium was not used for treatment here until September, 1913, but it was then applied to many of the cases which had entered the hospital before that time. 642 of the 1080 cases received radium treatment. The arbitrary date of January, 1916, was established in order that at least a year might have elapsed in every case reported before the results of treatment were assembled for study. The end results given, however, are carried up to date (January, 1917), and represent the results at periods from twelve to forty months after treatment was begun—an average of two years and two months.

During the period of time mentioned the Commission has been using only 235 milligrams of radium. This amount has since been greatly augmented through the kindness of friends of the University.

The tabular list of cases is as follows:

Carcinoma ..... (A)		
Buccal Cavity .....(39A)		
Lip	39	
Palate	8	
Jaw (lower)	36	
Jaw (upper—antrum)	11	
Tongue and floor of mouth	33	
Tonsil	7	
Cheek (buccal surface)	5	
TOTAL		139
Stomach, Liver, etc. (40A)		
Oesophagus	12	
Pharynx	9	
Gall-bladder and liver	2	
Pancreas	1	
Stomach	16	
TOTAL		40
Peritoneum, etc. ...(41A)		
Peritoneum and omentum	2	
Intestine (colon)	5	
Rectum	9	
TOTAL		16
Urinary Organs ...(45A)		
Bladder	3	
TOTAL		3
G.-U., Male .....(45A)		
Prostate	5	
Penis	2	
TOTAL		7
G.-U., Female .....(42A)		
Vagina	6	
Uterus	91	
Ovary	12	
Clitoris	1	
Vulva	2	
TOTAL		112
Breast .....(43A)		
TOTAL		143
Skin, Face, etc. .....(44A)		
Carcinoma	83	
Epidermoid carcinoma	58	
Rodent ulcer	34	
"Epithelioma"	21	
TOTAL		196
Other Sites .....(45A)		
Thyroid	7	
Neck glands	14	
Larynx	15	
Glands of groin, axilla, etc	5	
Parotid	2	
Nasal mucosa	3	
TOTAL		46
Sarcoma and Allied Tumors (F)		
Bone	16	
Soft parts	22	
Melanotic	8	
Endothelioma	2	
Brain tumor	9	
Myeloma	1	
Mixed tumors	4	
Hypernephroma	4	
TOTAL		66
Benign Tumors		
Papilloma	31	
Miscellaneous	10	
Breast	5	
Keloid	9	
Naevus	15	
TOTAL		70
Miscellaneous Conditions		
Keratosis senilis	33	
Tuberculosis	11	
Syphilis	11	
Lupus erythematosus	6	
Leukoplakia	8	
Leukaemia { Lymphatic .... 7 / Myelogenous .. 22 }		29
Lymphoma	40	
Effects of radium	9	
Deafness	11	
Apprehension	14	
Fibrosis penis	3	
Miscellaneous diseases (not radium)	53	
Skin lesions—miscellaneous	6	
Chronic inflammatory diseases	3	
No diagnosis	5	
TOTAL		242
GRAND TOTAL		1080

Certain groups of cases of cancer of special organs or regions have been allotted to different members of the staff for analysis. These more detailed analyses will be published under separate titles. It will be sufficient in this introductory statement to formulate briefly the general estimate which has been formed of the value of radium treatment of cancer in its more common and important situations, and the evidence in support of these conclusions.

39A—CARCINOMA OF THE BUCCAL MUCOUS MEMBRANES—139 CASES.

(a) Cancer of the lip, 39 cases; 19 treated with radium; 4 with complete success; 4 with

improvement, and 11 with no benefit. Squamous cell carcinoma in this situation is resistant to radium therapy. When the disease has metastasized to the regional lymph nodes no marked benefit from radium has been observed. Local recurrence, however, as in other superficial situations, can be affected favorably. It is our opinion that a grave responsibility rests on those who advocate radium treatment in preference to operation for cancer of the lip, in even its early stages.

Cancer of the palate, 8; tonsil, 7; buccal mucosa, 5; lower jaw, 36; upper jaw, 11; tongue and floor of mouth, 33—100 cases in all. Sixty-two of these received one or more treatments with radium; nine obtained some benefit from treatment. In the others the course of the disease was not materially affected. The best results were obtained in the cases of recurrent cancer of the jaw, where a neck dissection, performed at the time of the original radical operation, served to delay, if not to prevent, the glandular extension of the disease. In one such case local recurrence at the site of the original lesion on the jaw was destroyed with radium, and there has been no return of the disease in sixteen months. As a result of this experience we have recently treated a number of cases of otherwise inoperable mouth carcinoma by a primary neck dissection and subsequent radiation of the local tumor, and we are encouraged to hope that this method may prove effective in a certain number of cases not otherwise amenable to treatment.

40A—CARCINOMA OF STOMACH, LIVER, ETC.—40 CASES.

(a) Carcinoma of the esophagus, 12 cases. Five received radium treatment, and of these one obtained some relief of symptoms, although no permanent good was accomplished.

(b) Carcinoma of the pharynx, 9 cases. All treated with radium, and with no material benefit with the exception of one case which showed temporary improvement under prolonged treatment.

(c) Carcinoma of the gall-bladder, 1; pancreas, 1; and liver, 1—3 cases. The gall-bladder case and the pancreas case both received radium treatment, without notable improvement.

(d) Carcinoma of the stomach, 16 cases. Only one received radium treatment, which was given three times, with psychic, but no obvious physical benefit to the patient.

41A—CARCINOMA OF THE PERITONEUM, ETC.—16 CASES.

(a) Carcinoma of the peritoneum and omentum, 2 cases. No benefit from radium.

(b) Carcinoma of the intestine, 5 cases. Two cases were given radium without benefit.

(c) Carcinoma of the rectum, 9 cases. In 5 radical operation was advised; 3 accepted this advice, and 2 of these are well four years and eight years* after operation; 3 received radium treatment, with but slight, if any, improvement in their condition.

45A—CARCINOMA OF THE URINARY ORGANS—3 CASES.

Carcinoma of the bladder, 3 cases. Two received radium treatment, and 1 obtained some relief and is still under treatment.

45A—CARCINOMA OF THE MALE GENITO-URINARY ORGANS—7 CASES.

(a) Carcinoma of the prostate, 5 cases. Four received radium treatment. All are dead, but one of these obtained definite, but temporary, relief.

(b) Carcinoma of the penis, 2 cases, of which one was advised to undergo operation, and the other received radium treatment without benefit.

42A—CARCINOMA OF THE FEMALE GENITO-URINARY ORGANS—112 CASES.

(a) Carcinoma of the vagina, 6 cases. Four received radium treatment; all are dead, the average duration of life being six months from the time of beginning treatment.

(b) Carcinoma of the vulva, 2; clitoris, 1—3 cases. All received radium. In none has there been marked benefit from treatment.

(c) Carcinoma of the uterus, 91 cases. These cases form the basis of a special report by Drs. E. H. Risley and G. A. Leland, Jr., covering the period up to June, 1916, bringing the number of cases to 113. Ninety of these cases received radium treatment, as follows:

Group 1. Cases considered inoperable, and treated with radium, improved enough to justify radical operation: 5 cases; 3 living, 2 without recurrence at twelve and eighteen months after operation, and 1 case free from recurrence for two years after operation, then local recurrence, and now under treatment.

Group 2. Cases received for prophylactic treatment after radical hysterectomy: 5 cases; 2 free from recurrence twelve and fifteen months after operation; 2 recurrent cases, and 1 untraced, but free from recurrence eight months after operation.

Group 3. Recurrence after hysterectomy, 37 cases: 1 apparently free from disease; 2 doubtful, 5 living with recurrence, and 26 dead.

Group 4. Recurrence after curette and cautery: 21 cases; 4 living with recurrence and under treatment; 1 living and without evidence of disease nineteen months after beginning treatment, but since then untraced.

Group 5. Inoperable cases: 22; none free of disease. Average duration of life after beginning radium, twenty-two months.

Of the 91 cases, 5 living and apparently free of

* Entered Collis P. Huntington Memorial Hospital for suspected recurrence, which did not exist. Original operation by Dr. C. A. Porter, 1909.

disease, six, twelve, twelve, fifteen and eighteen months after beginning treatment; 2 living and apparently free from disease eight and nineteen months after beginning treatment, but since then untraced. Of the 7, 2 were being treated on a prophylactic basis, and showed, after operation, no evidence of recurrence. The other 5 were recurrent or inoperable cases.

(d) Carcinoma of the ovary, 12 cases; five received treatment with radium in varying amounts; 1 case showed temporary improvement, and died fifteen months after beginning treatment; the others showed no marked improvement under radium.

43A—CARCINOMA OF THE BREAST—143 CASES.

Radical operation was advised in 14 cases and accepted in 11 cases, 8 of which show no evidence of recurrence to date; 49 cases received radium, and 27 received x-ray treatment; 3 of the radium cases showed definite local improvement, but the internal progress of the disease was not affected. It is our opinion that x-ray treatment with massive doses offers more than radium in the palliative treatment of recurrent cancer of the breast.

45A—MISCELLANEOUS CARCINOMA—46 CASES.

(a) Carcinoma of the thyroid, 7; parotid, 2; axillary glands, 1; glands of groin, 2; cervical glands, 14; nasal mucosa, 3—29 cases. Nineteen received radium; only one of these cases, a carcinoma of the nasal mucosa, is apparently relieved of his disease. In all of the others the progress of the disease was not materially affected.

(b) Carcinoma of the larynx: 15 cases; 7 received radium treatment, and all are dead, although temporary improvement was observed in two cases.

44A—CARCINOMA OF THE SKIN, FACE, EARS, HANDS, ETC.—196 CASES.

Carcinoma, 83; epidermoid carcinoma, 58; rodent ulcer, 34; "epithelioma," 21. It is in cases of this superficial type that radium produces its most marked and beneficial therapeutic effects. Of the first group, carcinoma, 33, or 39%, show no evidence of return of the disease. Eight cases were operated upon without recurrence, and only 10 cases, or 12%, failed to obtain definite benefit from radium treatment. Of the 58 cases of epidermoid carcinoma, 15, or 25%, were relieved of all evidence of their disease, and only 9 cases, or 15%, failed to show definite benefit from radium treatment.

Of the 34 cases of the rodent ulcer (basal cell) type of carcinoma of the skin, 12, or 35%, were relieved of all symptoms, and 6 cases, or 17%, showed only temporary benefit, or none at all.

Of the 21 cases of "epithelioma," 9 were permanently relieved, 44%. Only one case obtained no benefit, and in one the benefit was only temporary.

To sum up these 196 cases of superficial carcinoma of the skin, in 69, or 35%, the disease was apparently destroyed, and in only 27, or 14%, did it appear to be so little affected by radium that the patient obtained no benefit. In all of the other cases improvement was manifest, although in a limited number of cases the disease recurred after apparent destruction by radium, and is again under treatment.

F—SARCOMA.

Bone, 16 cases; soft parts, 22; melanotic sarcoma, 8—46 cases.

Bone sarcoma, 16 cases; 3 treated with radium, of which 1 showed no improvement, 1 slight improvement, and 1 apparently relieved of all evidence of the disease.

Sarcoma of soft parts, 22 cases; 9 treated with radium—4 showed no improvement, and in 5 slight palliative benefit was obtained.

Melanotic sarcoma, 8 cases; three treated with radium with some benefit, but no permanent results.

MISCELLANEOUS TUMORS.

Endothelioma, 2; brain tumor, 9; myeloma, 1; mixed tumors, 4; hypernephroma, 4—total, 20.

In this miscellaneous group of tumors no material benefit from radium has been observed.

BENIGN TUMORS.

Papilloma, 31 cases. These occur in two groups: the papillomata of old persons, associated with keratoses, 25; and those of younger persons, 16. In old people papillomata are readily susceptible to radium treatment. Twelve of the 25, or 48%, were destroyed by radium, and 5 by caustics. Of the other group, only 2 were subjected to radium, and both of these successfully.

Keloid, 9 cases. Seven treated by radium, and all with benefit, although prolonged treatment may be necessary, and a strong application, made sufficient to cause a superficial burn, the fibrous tissue of keloid can be made to disappear with radium, leaving a flat and atrophic scar. The process is painful, but reasonably sure.

Naevus, 15 cases. Ten treated with radium, and all with benefit. Here long-continued mild treatments are required, but with perseverance the common port wine mark, as well as more prominent cavernous angiomata, can be made to diminish in color and size, and become less conspicuous.

MISCELLANEOUS CONDITIONS.

Leucoplakia Buccalis, 8 cases. Four treated with radium. The common superficial cases of leukoplakia can be made to disappear with radium. The process, however, is painful, as a superficial burn is required to eradicate the disease. It is to be advised only in the more productive cases, where the tissues are heaped up in

papillary masses, and for the simple milky glossitis type, fulguration, as carried out by Dr. C. G. Mixter, has, in our opinion, proved most effective.

Leukemia, 29 cases. Lymphatic, 7; myelogenous, 22. These cases form the basis of a special report by Dr. Francis Peabody. The lymphatic cases have shown themselves resistant to treatment with radium, while those of the myelogenous type almost invariably show beneficial effects from radiation of the spleen. The blood picture returns toward, if not to, normal, the spleen shrinks, the red blood cells increase, the patient's general health and strength improve, he gains weight, and he is often able to resume his regular occupation. It is rare, however, for the myelocytes entirely to disappear from the blood smear, and the disease is subject to remissions and recurrences. It would be premature to claim anything more permanent than a temporary remission of symptoms as a result of radium treatment, but this temporary remission appears to be more lasting and more certain than that obtained by other methods of treatment which have been advocated for this disease.

Lymphoma, 40 cases. These cases form the basis of a special report by Dr. C. C. Simmons and Dr. George Benet. Twenty-one of these cases received treatment with radium. Of this number, 18 were cases of typical Hodgkin's disease, 1 was lymphosarcoma, and 2 were malignant lymphoma in situations other than in the lymph nodes. In the 18 cases of the Hodgkin's type, radium treatment almost invariably produced marked regression of the lymphomatous glands, with shrinkage of the tumor masses, and improvement in the general condition. The regression was most marked in the more accessible glands (neck) and was not obtained in the deeper lesions (mediastinum). Furthermore, the regression was almost invariably temporary, and sooner or later recurrence of the disease took place. It is our belief that more persistent and heavier treatment, especially of the mediastinal glands, may yield more satisfactory results. Of the lymphosarcoma group, one case, although glands are still present, has received marked benefit from radium treatment, and is now in good condition eighteen months after beginning treatment. Of the 2 malignant lymphoma cases, both have apparently obtained a disappearance of their disease,—one of the palate and one of the rectum. The palate case recurred, but the recurrence also disappeared, and the case is now thirty-three months without recurrence. The rectal case has been free of disease for twenty-four months.

It would appear that tissue of the lymphoma type was especially susceptible to the action of radiation, and the use of radium in such cases is to be advised.

Keratosis Senilis, 33 cases. One of the lesions most amenable to radium treatment. Twenty cases, or 60%, were relieved of the disease, one case recurred and received further treatment, and only two proved entirely resistant to radiation. One or two mild applications are usually sufficient to eradicate the lesions, without the production of a burn, or, indeed, any material discomfort to the patient.

SUMMARY.

As a result of the use of about 235 milligrams radium in the treatment of 642 cases of cancer and allied conditions at the Collis P. Huntington Memorial Hospital, from September, 1913, to January, 1916, the following conclusions are justified.

1. Many cases of advanced, inoperable or recurrent cancer may be given benefit by treatment with radium.

2. In such cases the relief may include one or more of the following advantages: Relief of pain, diminution of discharge, rendering discharges less offensive, relief of hemorrhage, diminution in the size of tumor masses, even to their total disappearance; and the improvement in the general condition of the patient. To these must be added the undoubtedly beneficial psychic effect upon the patient.

3. In a very small number of advanced and apparently inoperable cases, improvement may occur such as to permit a radical operation to be performed.

4. In a certain proportion of cases of superficial non-metastasizing types of cancer (about 35%) and in a much smaller number of cases of metastasizing cancer, radium is capable of destroying the clinical manifestations of the disease. Time has not elapsed sufficient to report these cases as "cured," and they are being kept under observation. In a limited number of cases, recurrence, after apparent destruction of the lesion, has taken place. In certain situations, as on the eye-lids, radium treatment of these lesions is to be preferred to operation.

5. In keratoses, papilloma and other benign skin diseases regarded as "precancerous," radium is effective in destroying the clinical manifestations of the disease in from 48 to 60% of cases.

6. In myelogenous leukemia, the beneficial effects of radium are pronounced, and although recurrence of symptoms may take place, the clinical advantages of radium therapy are very marked.

7. In malignant lymphoma, lymphosarcoma, and Hodgkin's disease, the lesions appear to be especially sensitive to radiation, and definite, though temporary, benefit is obtained. When in accessible situations, it would appear that the disease could be controlled by radiation for a considerable period of time.

8. In the treatment of many other tumors and diseases radium has been used with benefit depending largely upon the extent of the disease, its depth in the tissues, and the practical ability to apply sufficient radiation to modify

or destroy tissue or tumor growth. Among the conditions in which radium treatment has proved of special value may be mentioned: recurrent or inoperable carcinoma of the cervix, or of the body of the uterus, Hodgkin's disease and malignant lymphoma, myelogenous leukemia, inoperable squamous cell carcinoma of the tongue, jaw and buccal mucous membranes, in non-metastasizing epidermoid cancer and in the more benign lesions of keratoses, papilloma, and other so-called precancerous conditions.

9. Radium therapy has proved, so far, to be of little benefit in recurrent carcinoma of the breast, carcinoma of the stomach and intestine, carcinoma of the glands of the neck, by extension from cancer of the tongue, mouth and lip, and in general in deeply seated metastatic extension of cancer from any region.

10. The use of radium in prophylaxis of recurrence after radical operation, for the cure of cancer, is not advised. Where serious doubt exists as to the complete removal of the primary tumor, and where the location of the suspicious area is superficial and accessible, and of small extent, radium may be used with benefit, but where a large area is to be considered, as after operation for breast cancer, the difficulties of covering the whole area with sufficient radiation are such that the treatment is not to be recommended.

11. The combination of radium therapy and operation, by which a tumor, otherwise inoperable, is excised as thoroughly as possible, the remaining tissues cauterized, and subsequently subjected to radiation, has yielded satisfactory results in several cases. This method of procedure is especially adapted to the more advanced cases of rodent ulcer, involving the face. After a period of radiation and observation of the open, granulating wound, extending over several months, secondary plastic operations have been performed to close the defects, and the results, up to the present time, in a very small number of cases, have shown no return of the disease.

12. Of 642 cases treated with radium in this series, 354, or 55%, received definite benefit.

13. Although many cases of advanced carcinoma show no appreciable benefit from radium treatment, it is also true that in no case yet observed has radium appeared actually to accelerate the growth of tumor tissue. Patients have suffered pain and inconvenience from the effects of radium burns in certain instances, but these have been of a temporary character. The constitutional effects of heavy doses of radium are unpleasant, and severe nausea and depression may occur; but these, also, are chiefly temporary in character. With continued and excessive dosage, very profound constitutional effects may be obtained. A serious diminution in the number of white cells in the blood is observed after continued heavy dosage. This is a more lasting phenomenon, and may be of serious importance in relation to the patient's resistance to infection. On this subject we are not, as yet, ready to report. In no other respect have we found radium to exert an unfavorable action upon the patient.

14. The considerable expense of purchase and the difficulties and dangers of administration of radium therapy are more than justified by the results obtained.

Mesothorium and Combination Methods in the Treatment of Cancer.

By F. D. Donoghue, M.D., Boston.

The late Professor Czerny, who inspired the erection and conducted the first cancer institution in the world, where all cases of cancer were looked upon as hopeful, in reply to a critic, made the following answer:

"Only slowly can the seed ripen which experimenters and therapeutists have planted in the ground, to mature slowly the fruit of a chemico-therapy of cancer. Under many barren stones are to be found here and there kernels of gold, which possess permanent value. A careful and experienced chemist is required to separate the true gold from the dross."

In our treatment of cancer, we have looked too enthusiastically forward to a specific for cancer. The effort to combine and correlate the various methods of proven value is a comparatively new thing. The results of the Huntington Cancer Hospital show how much may be accomplished in a well-conducted institution.

The standpoint from which I speak is the standpoint of the practitioner without a large institution, but who is willing to learn, from institutional experimentation, that which is best and safest for private practice.

There is undoubtedly a large group of cases of malignant disease which are hospital cases, but the general surgeon in the general hospital still ignores the possibilities of therapeutic means other than surgical, and the special hospital is apt to get only such cases as are looked upon as hopeless and incurable by the surgeon in the general hospital.

The inadequacy of surgery alone in controlling cancer is manifest.

That no satisfactory method for the treatment of cancer has yet been determined is evinced by the number of curative methods which have been devised, and which are in use. I do not think it can be said that the early removal of all cancers is the surest and best method of treatment, nor can it be said that surgical removal of cancer does not still deserve the most prominent place in treatment.

The results of operative treatment of cancer, however, are painfully disappointing, and while here and there brilliant results are obtained, on the whole the large per cent. recurring after operation is discouraging.

With the advance in surgical skill and diagnostic ability, we should naturally expect a decrease in the death rate from cancer.

Enough has been accomplished by ray therapy, in the form of x-ray, radium ray and mesothorium rays from radioactive substances, such as radium and mesothorium, to warrant a careful consideration of their value as an adjunct to surgery in what still may be called operable cases, and a substitute in those cases in which it is obvious that surgery is bound to fail.

Chemotherapy for cancer is not a new thing, for it dates back to the beginning of medicine, and almost every drug or chemical has at some time had its advocate, and modern experimental chemotherapy could have developed only as a result of this older work.

A statement made by the late Dr. Paul Ehrlich "that the principle governing successful treatment of parasitic disease is that parasites are killed only by those materials to which they have a certain relationship by means of which they are fixed to them."

Based upon this, Ehrlich discovered in "606," a substance that caused the disappearance of tumors due to syphilis.

The substances which have served as of some value in cancer therapy are largely of the heavy metal series. Of these arsenic, in its various forms, is the most favored. Atoxyl and salvarsan have been tried, and before the war put a stop to exchange of scientific ideas and experimentation, selenium was much exploited.

In this community, we are familiar with the routine and the results obtained by Dr. George W. Gay in the use of the compound tincture of iodine after operations, and in hopeless recurrences.

The first advocates of ferment therapy,—Susluna, Macini, Bouchut and Pean advised the injection of gastric juice or pepsin directly into the tumor. Shaw, McKenzie and Beard advocated the use of trypsin.

Various workers have injected animals with emulsions of cancer, but substantially all such have been failures as for being of value in the treatment of human cancer.

A reason for the conspicuous failure may be found in the false hypothesis on which this work was based.

Vaccination in cancer therapy has been found to have a definite effect in animals against transplant tumors, and apparently also cures growing transplanted tumors. "These facts do not seem to apply to subcutaneous tumors." (*Journal Amer. Med. Assn.*, Aug. 31, 1912. Reference, "Vaccination in Cancer," *Ztschr. f. Immunitatsforsch.*, 1912, xiii, 524.)

The works of Percy in the use of low degrees of heat in the treatment of cancer of the uterus have been interesting along the line that if the gross mass could be destroyed, the patient's natural defensive forces would take care of the present and future metastases, but he looks to massive doses of x-rays delivered through the medium of the Coolidge tube, as an important method in cases inaccessible to the knife and in the control of recurrences.

Can it be said that extensive mutilating operations are justified without an attempt to limit the growth or to cause an autolysis of the growth before operation is made?

Surgery alone, ray therapy alone, or chemotherapy alone, is not as satisfactory, and will not produce as good results, as a properly considered combination of these methods.

A surgeon, if he is to conduct the care of this specialized line of work, must be familiar with the kind and character of an operation which will be most favorable for future treatment, if he finds his case is inoperable, especially malignancy in the abdominal cavity.

There is great difficulty in controlling certain types of cancer cases, especially of recurrences, unless they are cared for in an institution. Where there is any extensive recurrence, it is a case for an institution, where intensive treatment may be followed, and where, in the present state of doubt as to the therapeutic efficiency of any method, careful observations and records may be made. The Huntington Hospital is of especial value to us from this standpoint.

Realizing our surgical limitations for more than ten years, I have looked for therapeutic aids.

One of my early cases in 1907, a case which I treated in conjunction with Dr. Alonzo K. Paine of Boston, and in which the x-ray treatment was carried out by Dr. Francis H. Williams, to whom we owe so much, endeavored to add to surgery of inoperable abdominal cancer, the method of providing free drainage from the cancer; to lower the resistance of the cancer cell by hard x-ray; and then to digest out the weakened cells by a solution of hydrochloric acid and pepsin corresponding in strength to the gastric juice.

In 1910 I had an experience with a case of extensive lymphosarcoma of the groin, which was refused by the City Hospital as inoperable, and which I operated upon August 23, 1910, assisted by Dr. Harry M. Chase, who has kept track of the case ever since. In that case, by reason of the tremendous swelling and the extensive disease, the scrotum with testicles was removed. The post-operative treatment was increasing doses of arsenic, and that case still remains well. Experiments in castration for mouse tumor, followed by resorption of the tumor, and in the removal of the ovaries as a palliative in inoperable breast cancer are interesting in connection with this case.

Werner, in July, 1912, called attention to the similarity of the effects of injected choline to x-ray and radium treatments noted in the experiments at the Heidelberg Cancer Institute since 1904. In these experiments, he was assisted by the late Dr. Stephen Szécsi, and

without reviewing their experiments, they found that the injections of borocholine, whether made subcutaneously, intramuscularly or intravenously, were followed by definite resorption of tumors in mice. Werner recognized the great biologic difference between animal and human tumors, but since the injections were non-poisonous and caused no constitutional effects except some slight pain, the use of borocholine on humans was begun and continued, in conjunction with ray therapy and such surgery as was possible, up to the time the war stopped their activity.

Their methods interested me and I studied them in 1912, 1913 and 1914.

Perhaps I should here disclaim any originality in the work on cancer. As a practising surgeon, doing private work only, I have sought the best methods which seemed safe, leaving research and experimentation to institutions.

The French, during this same period, had been experimenting with colloidal metals, and have reported results with selenium.

After the investigation of Neuberg and Caspari, colloidal metals were used in conjunction with choline, and they showed, in animals, that the combination of choline with the colloidal metal hastened the disappearance of a tumor.

Combination methods, then, are surgery, chemotherapy, as represented by borocholine, with or without selenium in the colloidal state, and ray therapy, either in the form of the x-ray, radium or mesothorium, together with the intravenous injections of thorium X.

The physics of radium in this community have become known through the work of Professor Duane of Harvard, and its curative properties through the work of Dr. Francis H. Williams, and later through the work of the Huntington Cancer Hospital.

Experiments of Prime, reported in the *Journal of Cancer Research*, April, 1917, show first, the great difference in the quantities of radium required to kill a physically functionating cell, as the heart muscle, and the normal growing cell such as found in the cell tissues or malignant tumors.

It is probable that the nucleus of the physically functionating cell is as much damaged as that of the inactive type, but as such cells expel the metabolic surplus in mechanical movements, and not in increasing in size and in dividing, as do the connecting tissue and cancer cells, the effect of the radium is not evident.

The second fact brought out in these experiments is that there is little or no difference in the radiations required to cause death of the cancer cell and the normal cell of similar histogenesis.

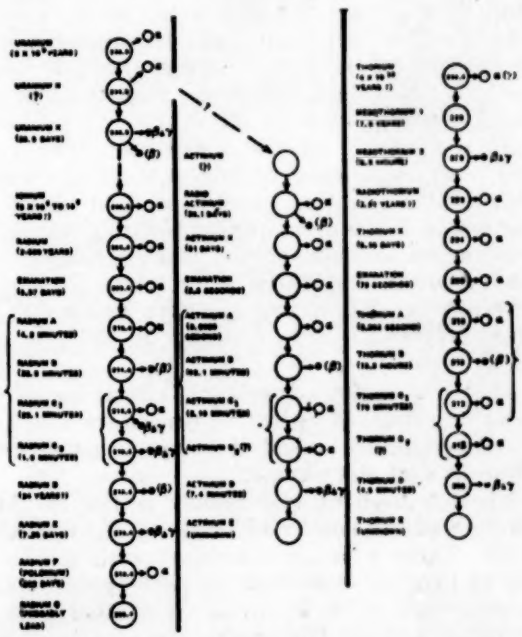
The conclusions are that radium does not kill the cells outright, as is shown by the persistence of beating in heart muscles, with injuries in nucleus in such manner as to prevent further division, which must result in the death of the cell, if its energy is expended in growth and division, and not in a purely mechanical function.

A well-known high resistance to radium to the cells of the central nervous system, which do not divide in adult life, is presumably correlated with the survival of the heart muscle cells after lethal exposures.

Mesothorium, with which I have had considerable experience, is the radioactive substance about which your chairman has suggested that I say something.

It is not my purpose to enter into an extensive discussion of the physics of radioactive substances, of which radium and mesothorium are the most important examples. It would be well to say, in passing, that there is a relation between all radioactive substances based upon their disintegration time.

The two mother ores from which these substances of proven therapeutic value from the standpoint of ray therapy are obtained, are the uranium and thorium groups, both of which have wide distribution. (Refer to the diagram indicating their relationship.)



In obtaining thorium oxide and its disintegration into mesothorium one and two, it is impossible to have a pure chemical salt. All thorium salts are contaminated with some radium content, and mesothorium itself contains rays of value as a 25% radium content, which remains constant, but the mesothorium continues disintegrating into radiothorium.

In considering the disintegration of these substances, we are apt to think of the disintegration periods as having a fixed line of demarkation, but there is no such line, and the disintegration is constant and continuous, and the time of the disintegration becomes more rapid as you go down the disintegration scale. The concen-

trated ray value is obtained by the use of mesothorium, and the rays are as in radium: alpha, beta and gamma.

"Mesothorium corresponds to radium in that it can be concentrated, and just as radium when first prepared gives out only the relative unimportant A activity proper to itself, develops, in time, enormous activity, due to the growth and accumulation of its products."

What actually happens is a steady growth and increase in A, B and Y activity of mesothorium for many years after its preparation, due to the growth of radiothorium and its products, and this change is also complicated by the fact that radium is invariably present in mesothorium preparations, and comes from the fact that monazite sand, from which thorium is prepared, always contains a minute amount of uranium, and therefore the corresponding amount of radium on concentration and extraction.

As there is no dearth of the raw material from which thorium can be prepared, it has been stated by Soddy that a single year's production would suffice to produce a preparation having many times the activity of all the radium ever extracted in the whole world, and by reason of the fact that it can be produced as a by-product in the production of thorium oxide, the cost of it should decrease once the demand for it is supplied.

If the theory of the x-ray men who have had most experience is correct, that the beginning of the curative process brought about by ray action is the decomposition of the lecithin of the nucleo proteids of the malignant cell into basic choline and fatty acids, then we should carefully consider pre-operative treatment in cases which we still consider in the operable class.

It is, of course, open to something of the same objection as operative procedure alone.

All neoplasms consist of two main elements,—the cells and the stroma.

The criterion of malignancy is the breaking through of the basal membrane by the epithelial cells. Those who are concerned with the methods of invasion and with the pathological classifications will do well to consult Walker's translation of Unna's Histopathology of Diseases of the Skin, New York, 1896; Bloodgood, *Progressive Medicine*, December, 1904; Adami, Principles of Pathology, New York, 1908; Hertzlei, Treatise on Tumors, New York, 1912.

TREATMENT OF CASES.

As treatment is still in the stage of evolution, certain illustrative cases will be discussed.

All pre-cancerous conditions or localized cancerous processes should be treated upon the clinical diagnosis. It is evident from the results following operations where there is recurrence, and it is apparent in many cases in which medical operations are done that the breaking down of nature's resistant barrier to the malignant process opens up lymph spaces and causes the growth apparently to change its character and develops a resistance to ray therapy which the original growth did not have.

There appears to be an essential change, perhaps due to the new soil into which the growth has an opportunity to extend.

PLATE 4.

Plate 4 shows a man of 78, referred to me by Dr. F. J. Hanley of Whitman, on whom a V-incision was made for the removal of an epithelioma of the lip, followed by a recurrence in the scar. This recurrence was extremely painful and had marked induration about it. Two applications of 10 mgm., with local application of 10% borocholine, caused a healing. This healing was followed by another breaking down of small amount which did not respond to mesothorium (Plate 5), so it was excised by a small V-incision, local cocaine infilt. anesthesia, without a recurrence. This represents the resistance of the recurrence of epithelioma in the presence of scar tissue, which is extremely resistant to ray therapy, but the combination of ray therapy with surgery will keep it in control.

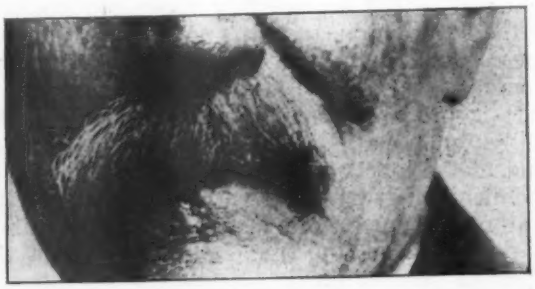


PLATE 5.

The use of ray on a recurrence of malignancy in scar tissue and its non-response to treatment, raises the question of whether scar tissue is more resistant to penetration to ray.

PRE-CANCEROUS DERMATOSES.

It has been pointed out that various keratoses form the commonest cutaneous lesions to take

on malignancy (Bowen, *Jour. Cutan Dis.*, 1912, xxix, 241).

Histological studies of pre-cancerous conditions have been made by numerous research workers (Greenough and Hartwell, *Jour. Med. Res.*, xv, 416; MacCarty, *Surg., Gyne. and Obst.*, 1913, xv, 1141).

The factors, however, that lead to malignancy must be numerous and varied. It may be that arteriosclerosis and other anatomical changes of old age may be factors in the development of epithelial malignancy. Warner (*Surg., Gyne. and Obst.*, 1916, p. 413) and Bloodgood (*Progressive Med.*, December, 1903, p. 149) believe that all acquired or congenital moles, that were subject to continuous irrigation, or began to grow, or showed any signs of ulceration, should be removed.

For this type of cases unfiltered mesothorium in small doses and short (thirty minutes to one hour) is the best method of removal. I have found it painless and safe.

Plate 6.

Plate 6 represents ulcerating keratosis.

Plate 7.

Plate 7. Cure following two half-hour exposures to 10 mgm. mesothorium.

Plate 8.

Plate 8 shows a border-line case. Mrs. C. H. Referred by Dr. Putnam of West Newton. Trouble started sixteen years ago in left side of nose. Was treated with electric needle. Six or seven years ago it broke out, healed and broke out. Treated by various salves. One-hour application 14 mgm. to the ulcerated left inner canthus, one hour to the tip of the nose, 10 mgm. Cured in six weeks. (Plate 9.)

Plate 9.

Mesothorium is not always in its effects destructive; its rays may approach the results of construction.

Plate 10.

Plate 10. Case referred by Dr. G. W. Dow of Lawrence. Represents a recurrence of an epithelioma in scar tissue, which resulted from the destruction of the original epithelioma by caustic, and with the recurrence of the epithelioma there was marked puckering of the lower eyelid so that the eye could not be completely closed. One one-hour application of 10 mgm. mesothorium, followed at intervals of a month by two applications of the same amount of substance for one-half hour each, not only destroyed the epithelioma, but it vascularized the scar tissue so that the scar tissue relaxed and the eye could be closed. (Plate 11.)

Plate 11.

Comparatively large growths in parts not surgically accessible can be successfully attacked.

PLATE 12.

Plate 12 represents an extensive epithelioma, involving the temporal region and extending into the ear and destroying the anterior part of the canal. First treatment began Jan. 10, 1917, and consisted of 40 mgm., one-hour application, followed by beginning healing. Subsequent dosage at one-month intervals for 40-minute applications of 20, 10 and 10 mgm., has brought about condition shown in Plate 13 of practical cure. Needs perhaps one more application.

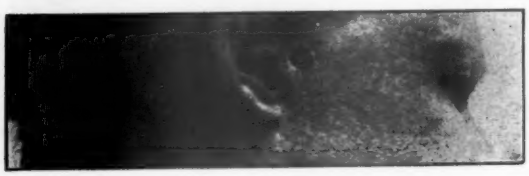


PLATE 13.

PLATE 14.

Plate 14. Mr. P., 52, married. March 2, 1916. Represents a very painful and markedly indurated lip with epithelioma. In this case the submental gland was palpable. This lip was so painful that the man could take only liquids, and the induration was so marked that it would not have seemed to me a favorable case when we depended upon surgery alone. Thirty-three milligrams of mesothorium for one hour caused, within 48 hours, a cessation of pain and a continued healing. Three other applications of 10 mgm. were given as the growth diminished in size, and at the end of nine weeks it was completely healed and has remained healed. (Plate 15.)

As the healing process went on, the submental gland became smaller, and a month after the healing-process could not be palpated.

PLATE 15.

In the autolysis of the cancer cells necessary to the healing of the lip, is there produced the substance which has an influence upon the isolated cancer cells which may have been carried in the lymph stream?

Is the shrinking of the gland, which follows the disappearance of the cancer, due to the elimination of the cancer alone?

PLATE 16.

Plate 16. E. L. C., railroad worker, 48, single. Feb. 25, 1913. Represents a recurrence of an epithelioma in a scar. This was resistant to liquid oxygen ray therapy, a portion of it healing, and then the entire scar tissue was excised under local anesthesia, with a complete healing and no recurrence after four years. (Plate 17.)

PLATE 17.

PLATE 18.

Plate 18. Patient, aged 64, referred by Dr. M. W. White of Somerville. Wife had extensive carcinoma of breast and mediastinum. Epithelioma at this age responds well to mesothorium. Cure obtained (Plate 19) in eight weeks, by relatively light dosage.

Plate 19.

Malignant disease of the tongue and mucous membrane of oral cavity, seen late, does badly as a rule under all forms of treatment. Taken early, satisfactory results are sometimes possible.

Mr. M., referred to me by Dr. F. E. Withee of Newton Highlands on Sept. 3, 1916. He showed an ulcerative papilloma inside the right cheek about one-half inch in diameter, and extending down from ulcerative process and onto gum was a distinct leucoplakia. Enlarged glands not discernible to palpation. Wassermann negative. Two applications of 14 mgm. mesothorium for one hour each caused a disappearance of the papillomatous growth. The leucoplakia was more resistant, and after 15 half-hour applications of 10 mgm. mesothorium there was a small spot on the gum margin at base of right second lower molar on March 10, 1917.

METHODS OF INJECTION OF BOROCHOLINE.

There is the subcutaneous method which I have discarded because of the danger of the production of sloughs.

The second method is the intramuscular method of concentrated solutions of borocholine. Five per cent. solutions are best borne, and after a time, 10% solutions are borne. These injections are made deep into the muscles about the shoulder girdles, and in the gluteal regions, until 3 grams of basic choline is given.

Colloidal selenium vanadium is also given in the same manner, sometimes with the choline. I now give 2 cc. of selenium (Laboratory Clin. preparation) to 8 cc. 5% solution of borocholine.

Intravenously there is a considerable reaction, and it is given in a similar manner to salvarsan at the most accessible vein at the bend of the elbow, and is given in the proportion of 10 cc. of 10% choline to 50 cc. normal salt solution.

Combination of choline, ray therapy, operation, ray therapy:

Mr. A., age 56, came to me on April 10, 1914, with a tumor in lower part of left breast, which he had noticed for six months. The skin was not puckered, but the growth was not freely movable. From April 10 to May 24 he was given 12 intramuscular injections of 10 cc. of 5% borocholine with 1 cc. of electro selenium vanadium (Laboratory Clin.). The tumor shrunk and became harder and movable.

Operation May 31. Tumor removed, and proved to be a spindle-celled sarcoma. Following operation, 50 mgm. mesothorium with 1 mm. filter of lead and surrounded by rubber tissue, was left in wound for 12 hours. Wound then closed.

Returned on June 16 and 25 for treatment.

On Feb. 18, 1915, recurrences appeared in scar. Again, 6 choline injections. Excision of scar. Ray therapy as before.

No recurrence to date.

In cases of doubtful diagnosis it is well to try out these methods before extensive mutilating operation is advised.

Mr. H. G., 48 years old and married. Referred to me by Dr. Hollingsworth of Providence, on March 22, 1914. Gives a history that January, 1914, was troubled with his tongue. He was a jeweler and worked where there was a great deal of acid. Tongue scraped on his teeth. Consulted Dr. Arthur Hollingsworth. Operation was done the last of February. Small nodule on left side of tongue was removed. Under microscope appeared to be a round-celled sarcoma. In two weeks had recurred twice the size of a pinhead. Second operation March 13; the size of a pea. No enlarged glands. Works in nitric acid fumes and also used a lot of blue vitriol. Was given injections of 10 cc. selenium vanadium for a week, followed by a solution in two weeks and one application of mesothorium—14 mgm. mesothorium one hour, by stirrup method. Complete disappearance of growth.

Later the slides were referred to Dr. F. B. Mallory of the City Hospital, who made a diagnosis of hemangioma.

Where there is a malignancy of the pleura or of the lung, with or without the accumulation of ascitic fluid in the chest, the relief of the dyspnea, which is the most constant symptom, may be obtained by the injections of choline alone or by the use of thorium X solution. By the mouth, 25,000 units a day may be given with marked relief of dyspnea. This has been repeatedly shown in my cases. It may also be given intravenously.

Mrs. F. W. Following operation for breast, there was mediastinal recurrence. Seen in consultation with Dr. Garland. There was also some swelling of the arm. In this case the chief complaint was dyspnea. After a few intramuscular injections of choline in the muscles of the back, thorium X was used in 25,000 unit strength daily, and her symptoms were relieved within the first week, and did not recur until shortly before her death.

In inoperable and recurrent cancers, radium, with or without chemotherapy, is substantially the only therapeutic agent that we have, and in the inoperable cases, when we give them comfort we are doing a great deal.

I have used various methods in bringing relief to hopeless, recurrent cases, the most painful type represented by the pressure either upon the nerve trunks in the neck or in the nerve trunks of the pelvis. With the pressure of the nerve trunks in the neck there may be a tremendous swelling in the arm on the affected side, and in addition to the actual pressure in the neck is the discomfort from a hand and arm,

and the fingers cannot be bent or the joints moved on account of the swelling.

This seemingly hopeless case responded surprisingly well:

F. W. S., 43 years old. Patient of Dr. George W. Ryan. Wife died of carcinoma of the liver in 1911. June 15, 1913, first noticed trouble. Complained of trouble in stomach and abdomen. Was seen by Dr. Broderick, Jamaica Plain. Advised operation. Operated on by Dr. F. B. Lund, Boston City Hospital. Dr. Lund made an exploratory operation and made a diagnosis of carcinoma of the liver. He returned from the hospital October 1, 1913. Diagnosis, carcinoma of the liver. October 15, 1913, was treated by Dr. Howard Kelly of Baltimore with a five-hour application of 600 milligrams of radium filtered. Remained in the hospital two weeks and then returned home. He was told by Dr. Kelly to return in six weeks for treatment, but was too much used up to go back. January 7, 1914, patient developed jaundice. This time he was unable to be up and about. No specific disease and the Wassermann was negative.

Entered the hospital under my care on January 8, 1914. The liver at that time was three inches below a line from the umbilicus to the anterior superior spine. Beginning Jan. 9, 14 doses every other day of choline and selenium vanadium, one part selenium, 9 of a 10% solution of borocholine; 2 intravenous injections of thorium X.

Jan. 28 to Feb. 4 was given cholalin, half a grain, three times a day on account of clay-colored stool.

Feb. 4 to Feb. 18, eight injections, 10 cc. of choline selenium diluted with 20 cc. of ascitic fluid and six injections of 30 cc. of 10% choline selenium, intravenous thorium X; 500,000 units Feb. 4.

Following Feb. 18 he had two weeks' rest at home. He developed an ischio-rectal abscess, which was opened May 1 under cocain. Received the combined treatment regularly from March 1. Was tapped on Feb. 4 and some fluid accumulated and was drawn. Twelve injections were given up to Feb. 9, 1914. July 10, 1914, case was able to do ordinary work and wanted to go back; was in very good condition and went back to some work. He left this part of the country and went West, where he died some time in 1916.

The work of Hodenpyl in treating cancer of the liver with ascitic fluid takes on new interest in connection with this case.

In addition to those that are inoperable, there is another large group of cases in which amelioration may be obtained by combination therapy, in persons suffering with a complication of malignancy of heart disease, nephritis, or marked arterial changes, or the result even of apoplexy. We certainly are justified in extending to this type the amelioration that comes from ray therapy, and in all cases where operation is contraindicated we still have recourse to ray therapy. There has been a marked advance in x-ray therapy since the advent of the Coolidge tube, with perhaps the use of larger currents and the development of larger quantities of rays in a shorter period of time.

In actual treatment, mesothorium is found to be more active superficially; somewhat less active through a great thickness of tissue.

For prophylactic treatment, roentgen rays are preferable to radium because larger surfaces can be uniformly rayed. If a deep-seated tumor cannot be made accessible, here again x-ray is preferable.

CONCLUSIONS.

All superficial ulcerations and all pre-cancerous conditions yield readily to local ray therapy. Moderate doses should be used at the beginning, not exceeding 30 mgm. hours at one dose. If there is no response, choline injections are injected intramuscularly as a preliminary to a second dosage. Large ray doses are indicated for deep cancers, which should be made accessible to the surface, so that there is a certain application of the rays to the malignant cells, and when large doses are used there should be means provided for the draining of decomposition products.

A desirable thing is to cause a disappearance of the cancer cells rapid enough to overcome its growth, and slowly enough that too much cancer toxin is not set free into the system.

In all cases of carcinoma of the breast, the follow-up treatment by chemotherapy and ray therapy, as represented by the x-ray, is desirable.

I am convinced, however, that there should be some properly correlated method of treatment, under some device so that when a surgeon has done what he thinks best, and recurrence, which occurs in the greater majority of cases, takes place, there should be some method known so that these poor unfortunates are not exploited by charlatans, and drift despairingly from one person to another because there is no authoritative voice to indicate a rational course for them to pursue.

Very few physicians in private practice can afford to purchase or maintain the armamentarium necessary for large ray dosage, and even if the radioactive substances are given freely, it is impossible to maintain the patients under these conditions so as to secure the best results.

There is not enough radioactivity in the world to treat properly malignancy by the massive dose method alone.

The substances necessary for massive doses must be so handled that all the twenty-four activity may be utilized, and that the tremendous loss that exists through wide distribution and limited ray use may be obviated.

Massive doses should be reserved for large growths, where it is possible to have complete drainage. Growths on epithelial surfaces, especially where there is free lymphatic anastomosis, should be treated by chemotherapy, ray and excision, without extensive dissection.

Where there are metastases, no treatment is other than palliative. Marked cachexia is also a contraindication to operation.

DISCUSSION.

Dr. Edward Reynolds, Boston: I have listened with especial interest to the communications of Dr. Greenough and Dr. Donoghue, because both of them have been so judicious in the limitation of their statements, in marked contrast to many of the reports which are presented by radiologists.

The results of the last five years of treatment by various forms of radiation have certainly failed to justify the hopes of cure of cancer by radiation, which were at one time entertained, with the single exception of the limited field referred to by both the speakers, and so well illustrated by Dr. Donoghue's photographs,—the malignant and semi-malignant diseases of the skin, in the early stages of which radiation is certainly effective. Both speakers have emphasized the fact that this does not imply the use of radium as a curative agent to cancer in other localities.

The experience of recent years is, however, steadily more encouraging on the use of radiation as a palliative in the treatment of advanced and incurable cases.

My own special field today is to speak on what may be called the preventive or prophylactic surgery of cancer, on the treatment of early cases,—a field the hopefulness of which is in marked contrast to the use of the radical operations for established cancer, or of radium for the advanced and incurable cases.

Cancer has long been looked upon by the laity as a hopeless and incurable disease. Even the medical profession knows only too well that under our former conceptions of it, its prognosis was anything but good, even after the most radical treatment. Our exact scientific knowledge of its nature is still far from complete, but from a practical standpoint we now know that most cases go through what is often termed a pre-cancerous stage, in which the disease is essentially curable.

The importance of disseminating this view, not only to the widest possible degree throughout the profession, but also among the laity, led to the formation about five years ago of the American Society for the Control of Cancer, which has since been conducting a widespread campaign of education, both among the laity, and by the coöperation of the state and national medical societies, throughout the profession. Much good has already been accomplished, and much remains to be done. We may be proud of the fact that the Massachusetts Medical Society is now among the most active of the several state societies in this campaign, and this present discussion is one of the evidences of it.

Our present conception of the natural history of cancer is in sharp contrast to that which most of us were taught in our student days. We know now that most cancers occur at a spot which has been subjected to continuous irritation, either mechanical or physiological; that the first sign of their presence is usually a proliferative activity of the epithelial cells at this spot, which is always strictly localized and usually, for a greater or less time, non-malignant. This condition constitutes the so-called pre-cancerous stage. Our present conception of our first duty as diagnosticians is to attempt to diagnose these conditions while they are still non-malignant, and capable of relief by minor methods, thus avoiding the radical and disfiguring operations.

We know, too, that even after the appearance of malignant cells there is a stage, which is brief in some localities and fairly long-continued in others, during which the malignancy is strictly localized, and is still susceptible of radical removal and cure. Our second objective is to diagnose the disease, at least, in this stage, even in the less accessible localities. An extensive and radical operation, if performed then, yields almost a certainty against recurrence, while we all know that such operations performed only a little later give but a too small percentage of permanent immunity.

The classical diagnostic signs of malignant disease, which we were all taught, are now known to be distinctively the signs of its incurable stages, and for the most part, of its incurable stages only. The physician who waits for them throws away his patient's chances and neglects his duty in our present state of knowledge. The curable stages of cancer cause no pain. The symptoms vary with the situation. They are never distinctive, but are usually sufficient to warrant suspicion, which should then be immediately confirmed or dispelled by the most thorough possible physical examination and, in case of doubt, by operation. To wait for an assured diagnosis from symptomatology means losing the prospect of cure.

We now draw no sharp line between benign and malignant growths. Many benign growths eventually become malignant, and such growths should, therefore, be removed without delay. In most cases this can be done by really trifling operations.

The symptoms which should arouse suspicion vary with the locality in the body at which the growths occur, and it is impossible in a brief time to speak of all of them, but the great majority of all cancers occur within the limits of a few situations, and these more frequent classes can be summed up in a few minutes.

The Breast. This is a situation in which a very large proportion of all chronic lumps become malignant, and it is, moreover, a situation in which malignancy often occurs early and always generalizes with great rapidity. The acute lumps which occur in the nursing breast usually clear up completely, and if they do so are unimportant. Such breasts should always, however, be examined later for possible persistence of the lump. All other lumps in the breast should be regarded as suspicious,—they should always be removed without delay, and while it can be done by a non-mutilating local operation of trifling grade.

It is always important that a new growth should be examined microscopically while the operation is still in progress, so that if malignant tissue is found, an extensive and radical operation can be done at the same sitting; radical operations performed even a few days after the removal of a suspicious growth are far less successful than those which are done at the time. This is especially important in the breast; in this situation, in particular, a radical operation done even a week or ten days after an exploration is very rarely successful in affording permanent immunity. Never cut into even an apparently benign growth. Cut around it in clear tissue. Malignant cells may be present in any such case, and an incision into malignant tissue makes a local recurrence probable.

Cancer of the Uterus. Cancer of the cervix uteri becomes generalized very early, and is, therefore, one of the most fatal of all cancers. This is, on the other hand, one of the localities in which

the prevention of cancer is easiest. Cancer here is almost invariably preceded by erosion, usually in a somewhat large and hard cervix. The symptoms of erosion are the appearance of an irritating leucorrhea; every such discharge should be regarded as suspicious, and lead to prompt physical examination. When all such cervices are treated by prompt repair (usually best by a V-shaped amputation) cancer of the cervix will hardly be seen. A later symptom is the appearance of slight, irregular bleeding. Slight stainings after mechanical contact with the cervix are especially significant.

When an eroded cervix begins to bleed, its amputation is imperative and must usually be extensive. Such specimens should be examined at the time of operation, and a radical operation performed at the same sitting if malignant tissue is found.

Cancer of the uterine body is less common, less rapid, less unfavorable. Its first symptom is irregular flowing, most often slight and serous in character. Any recurrence of flowing after the menopause is especially significant. On examination, the uterus is found moderately enlarged. These symptoms may mean only a benign hypertrophy, but they are equally characteristic of adenoma, adenocarcinoma, and even of early true cancer. After an early hysterectomy the prognosis of even a true carcinoma of the corpus uteri is very good. A positive diagnosis can be made only by the microscope after a curettage, which should be very thorough, as in early cases the disease is often limited to one spot. Hysterectomy should be done at the same sitting if malignant tissue is found.

Cancer of the Digestive Organs. While these are among the most common situations for cancer, they are, unfortunately, among the most unfavorable from their inaccessibility and the difficulty of making positive early diagnoses. It should be especially noted that it is very rarely possible to detect a mass before the cancer is incurable.

Every case of chronic indigestion which resists ordinary treatment should be considered suspicious and subjected to the most thorough physical examination, including the bismuth x-ray and analysis of the secretions. Vomiting of blood or the appearance of blood from the anus are later, rather than early symptoms. Every such case demands the most thorough examination, and unless an evident cause for the loss of blood is found, an exploratory abdominal incision is warranted.

Cancer of the Skin. Here the disease for the most part originates in or about warts, moles or birthmarks. They ordinarily assume malignancy slowly, and from their accessibility and visibility should always be diagnosed early. Any wart, mole or birthmark which becomes irritated, enlarges or undergoes change of color should be promptly removed by whatever method will make the least scar. Superficial proliferations of the skin are often best removed by freezing mixtures; small, deeper ones by the knife or scissors,—escharotics should not be used.

The American Society for the Control of Cancer is now actively at work in the preparation of a pamphlet designed for circulation among physicians, in which the latest views on the nature and treatment of cancer in its many forms will be given in detail. All that will be said in it may be regarded as highly authoritative, since in addition to its having been prepared by a committee of eminent surgeons and pathologists, its entire substance will have been read and assented to throughout by the National Council of the Society, which is composed of prominent members of the profession from all over the country. The standing committee on cancer of the Massachusetts Medical Society anticipates that copies of this pamphlet will be distributed by the Massachusetts Medical Society to physicians throughout the state. We hope that this pamphlet will be read and preserved for reference.

DR. THOMAS ORDWAY, Albany, N. Y.: As a result of the papers and the discussions this afternoon, I am tempted to speak of a great many things, but because of the lateness of the hour and the closeness and heat of this room, which I know is fully as intolerable to you as it is to the speaker, I will limit my remarks to a few suggestions and conclusions.

I might discuss the question of psychic treatment, which plays a great part in cases of inoperable cancer, and particularly in the so-called combined methods. I might also speak of the possibilities of using radioactive substances in private practice, for that certainly is a possibility. I might refer to the work of Ehrlich and Wassermann and others; but I will refer particularly to the variability in the life history of cancer, which accounts, I believe, for many of the alleged cures. Many surgeons and physicians, not having intimate association with cancer from the beginning to the end, in a large number of cases do not realize the great variability in the natural history of cancer, a variability from two years or three years, to seven, nine, thirteen, and in one instance I remember of a case which was histologically cancer apparently existing for twenty-five years. I might also refer to the question of heredity in cancer, and to cancer in animals as compared with cancer in humans. I will, however, limit myself to a few statements, and wish to emphasize, at the outset, that I agree absolutely and completely with the conclusions reported by Dr. Greenough.

Marked changes may occur on the fingers of those engaged in routine work with radioactive substances. These local objective changes consist chiefly of flattening of the characteristic ridges, thickening and scaling of the superficial layers of the skin, and even atrophy and intractable ulceration. These lesions are usually slight compared with the marked subjective symptoms, such as paresthesia, anesthesia of varying degree, tenderness, throbbing, and even pain. The persistence of such effects is noteworthy.

Various general systemic symptoms and also blood changes may be produced by exposure to radioactive substances. To avoid such local and general disturbance, special protective and preventive measures have been devised, and those engaged in routine handling of radioactive substances are particularly cautioned.

Surface applications of radium in leukemia produce striking, indeed remarkable, improvement in the blood picture, which becomes almost normal; in the size of the spleen and glands, which are reduced almost to normal; in the general condition of the patient who, from an emaciated and weak condition, may become plump and strong. The duration of remission is variable; it may last from months to years. The results of radium treatment are *not* regarded as curative. It is believed to be, however, the safest, as well as the most prompt palliative measure in cases of chronic leukemia,

whether *refractory* or not to benzol or x-ray treatment. From the results of radium therapy in leukemia, it is believed to be the best form of treatment now at our disposal.

Toxemia. May be avoided by proper diet, dosage, and clinical observation.

The best, apparently curative, results from radium therapy are obtained in certain types of skin cancer and other localized forms of cancer. In many cases of true cancer which have advanced beyond the operable stage, or those recurring after operation, improvement from radium therapy may follow, not only subjectively, but in the local condition. This improvement may include relief from discharge, hemorrhage and pain, cleansing or healing of ulceration, diminution in size or disappearance of the growth. Such cases, however, are rarely cured. Even large growths sometimes disappear under the influence of radium, but meastasis or spreading of the growth to other parts, is not prevented, or the patient may succumb to the rapid disintegration of the original growth.

Exceptional Cases. As the lawyer in cross examining a medical witness, is apt to cite an exceptional case as the rule, so this is frequent in those reporting results of radiotherapy, and tends to place the latter in disrepute, but it would seem that intensive study of these very unsual and exceptional cases might enable us at least to add to such cases.

Newer methods may improve these results of radium therapy; at present its proved value is limited, but occasionally cases beyond these well-recognized limits are distinctly benefited.

From the various and often conflicting reports as to the question of dosage in radium work, and from personal observation, it does not seem that any definite system or fixed basis of dosage can be given. There are, evidently, limits beyond which it is not safe to go, and below which little good can be expected. The main object is the results, as measured by the improvement not only of the local, but the general condition of the patient. The dosage and all other factors must be managed best to secure this.

It is of the utmost importance in reporting cases treated, that accurate data should be given concerning the general condition of the patient, as well as the local findings, and that the end-results of all cases should be demanded, if necessary, by secondary reports. Reports of cases without such observations, and without subsequent reference to the final results, are misleading, and have been productive of much disappointment to both the physician and patient.

The Roentgen Diagnosis of the Pathological Gall-Bladder.

By A. W. George, M.D., Boston,
and
R. D. Leonard, M.D., Boston.

The ability to detect gall-bladder disease by means of the Roentgen ray has made favorable progress during the past two years. In this line of work, however, the European roentgenologists have given us but little help. The war of course has temporarily paralyzed all foreign scientific work except that of distinctly military value. Furthermore, the European fluoroscopic method of abdominal examination is not suitable for gall-bladder work. Only by the use of serial plates can the gall-bladder and its contents be visualized.

Even in this country until recently the only direct Roentgen evidence of gall-bladder disease was the demonstration of gall-stones. Roentgenologists have competed with one another as to which one could show the greatest percentage of stones. These percentages have varied all the way from 20 to 100 per cent.

Most of us soon realized the uselessness of this sort of work, first because of the incompleteness of our data on which to base figures, and second, we realized that the mere presence of gall-stones was not necessarily an etiological factor in the patient's symptoms. Many apparently normal persons have gall-stones. So we have endeavoured to find further diagnostic evidence of gall-bladder disease.

This evidence is of two types, the indirect, where the effect of gall-bladder disease is demonstrated on other organs; and the direct, where the gall-bladder itself is visualized on the Roentgen plate. This demonstration of the actual gall-bladder is the important factor in the Roentgen diagnosis of gall-bladder disease.

From our experience in the study of hundreds of right upper quadrants, we are convinced that with our present technic, the *normal* gall-bladder cannot be demonstrated on the x-ray plate. And that only when some abnormal change takes place, such as a thickening of its wall, increase in size, presence of tarry bile or stones, or, in brief, some alteration of its normal density, only then will the outline be visualized on the plate.

The converse of this proposition is our working hypothesis, namely, if the gall-bladder shadow is seen on the Roentgen plate, that gall-bladder is pathological. In the future this theory may be proven unsound, but with our present technic the practical results justify its use.

As a corollary to this proposition a problem frequently arises. The report is made to a surgeon that his patient shows x-ray evidence of a diseased gall-bladder., The surgeon operates, and tells us that our intrepretation is wrong, that he looked and felt of the gall-bladder and it was normal. Now we feel that no one has any right to say that a gall-bladder is free from disease unless it is opened and its lining inspected and the character of the bile observed—better still, the removal of a piece for microscopic examination. I believe that the x-ray will reveal pathological changes in this organ or its contents which cannot be detected by mere external inspection or palpation. This question perhaps will be taken up more fully in the discussion.

There is no special technic. Intensifying screens must always be used. The patient must be taught to hold his breath. The tube must be

of sufficient hardness just to penetrate the patient.

DISCUSSION.

DR. GEORGE CARROLL SMITH, Boston: According to Dr. Leonard's paper, the presence of gall-stones in the gall-bladder does not of necessity make a pathological gall-bladder in the roentgenological sense, hence this may explain the fact that an indefinite number of such cases cannot be shown by x-ray. This view is quite consistent with the statement of many writers in clinical medicine.

There are two theories as to the origin of gall-stones. The followers of Naunyn believe that cholesterin—the main constituent of gall-stones—is neither a metabolic product nor a secretion of the inflamed or infected mucous membranes of the bile ducts and gall-bladder, and the lime salts,—the other chief substance composing the gall-stones,—originate in the same way, that is, without primary change in the mucosa and its infection. Cholesterin and bile salts are not aggregated into gall-stones. More recently, followers of Aschoff and Backmeister believe "that cholesterin is precipitated from bile itself, and that inflammatory change of the mucosa of the gall-bladder is unnecessary to form gall-stones, but obstruction of the outflow of bile is sufficient; furthermore, it may be precipitated in aseptic conditions and without inflammatory change." Concentration of cholesterin and a reduction in solubility and resorption, may and unquestionably do, form pure cholesterin stones in this way. Most authorities, however, agree that fixed gall-stones depend upon infection. Associated with infection, there is: (1) stasis of bile, (2) precipitation of cholesterin, (3) cleavage of albumin content, and (4) epithelial degeneration.

Elsner says that 10% of all autopsied bodies show gall-stones, and of this number 95% never had symptoms which suggested their presence. If, then, the roentgenologist, with increasing experience, is ever able to show all such, he will render much greater service to the clinician than by showing the presence of stones which we already know are there by their marked clinical symptoms. Permit me to say in closing, that I have grave doubt about the large per cent. of gall-stone cases quoted as presenting no symptoms. They are probably accompanied by such slight symptoms of backache, dyspepsia, bilious headaches, that the patients are too often left to make their own diagnosis. More careful study of the slight, indefinite and vague symptoms, in many cases, would lead to a correct diagnosis of gall-stones. Often, our greatest difficulty is reached when the question comes up what to do with the cases of so-called gall-stones without symptoms. Of course, each case should be decided upon, *only* after careful study; as a rule, the very young and those over sixty years of age should not be operated, while the others should be carefully watched with a view to operative procedure.

DR. CHARLES C. CARROLL, Dorchester: The diagnosis of pathological gall-bladder is at times extremely difficult. Nearly every surgeon will admit that, after bringing to bear all his knowledge of theory, operative experience, and painstaking effort at differential diagnosis upon what seems to be a lesion of the upper abdomen, and then, after surgical interference and careful inspection of the structures that could give rise to the clinical symptoms, including a gall-bladder that seemed innocent, one that was normal in size, shiny, robin's egg blue, not thickened, no adhesions and compressible, he may continue the search in the lower abdomen and find an abnormal appendix, generally of the retroceca lype, remove it as the sole disturber, and close the abdomen with the operative diagnosis of chronic appendix. After an interval, the patient is perhaps no better so far as the upper abdominal symptoms are concerned, and then the surgeon realizes that he has been mistaken in his interpretation of the case. Subsequently, operative interference is again resorted to, the gall-bladder removed or drained, and the symptoms vanish and the patient regains his health.

Gibson of Philadelphia, a few years ago read a paper on gall-bladder disease before this Society, in which he recounted his experiences, and cited a number of cases to bring out his failures in this field, maintaining that an innocent-appearing gall-bladder may be pathological and harbor an infection that can be vicious in its manifestations.

It is generally admitted that lesions in the upper abdomen are frequently atypical and difficult to interpret, and that appendicular disease at times closely simulates upper abdominal symptoms; in fact, in my experience, it is the rule to find a chronic, generally retrocecal, appendix with the pathological gall-bladder.

Braasch, in a recent consideration of two hundred and fifty-one cases of nephrolithiasis, found that in 12% pain due to the lesion was referred to the region of the gall-bladder. Cholecystitis and duodenal ulcer frequently cause adhesions between neighboring organs, such as duodenum, gall-bladder or colon, thus further complicating the diagnosis.

From what has been said, it is apparent that one's diagnosis of gall-bladder disease is not always secure, and it would seem that any procedure that assists in arriving at a more certain interpretation should be welcome.

I have been familiar with the efforts of Drs. George and Leonard in this field for the past two or three years, and when in doubt have submitted my cases for Roentgen examination. I have had some twenty-five cases in this series; Dr. George reported stones in four, all young women who had not borne children, ages twenty-three to twenty-five; all had chronic appendices and no history of typhoid. Case 1. Mrs. S. Clinical diagnosis, gall-stones and chronic appendix. Roentgen diagnosis, gall-stones and chronic appendix. Operative diagnosis, gall-stones and chronic appendix. Fifty-two white stones were removed at operation; no adhesions; gall-bladder not markedly thickened; gall-bladder drained, not removed, badly kinked retroceceal appendix removed. Case 2. Miss H., 23. Clinical diagnosis: chronic appendix, pelvic tumor, and question of gall-bladder or duodenal ulcer. Roentgen diagnosis: pathological gall-bladder, no duodenal ulcer, chronic appendix. Operative diagnosis: one small stone and very foul gall-bladder, which was not adherent, thickened and of normal color and compressible. Chronic appendix and hematocele of left broad ligament. Gall-bladder not removed because of operative work done in lower abdomen. Case 3. Mrs. J., 25, married, no children, no typhoid. Emergency operation for ruptured tubal pregnancy; exsanguinated at time of operation. No history taken until recovery from first operation, when she was told she probably had gall-stones; al-

lowed to sit up in bed on twelfth day. In the next thirty-six hours she had three typical attacks of hepatic colic. Because of fear of common duct impaction, I had her x-rayed. Report: stones in gall-bladder extending into cystic duct. Operation following day revealed a stone two inches long, an inch and a half wide, and about an inch and a quarter thick, filling the fundus of gall-bladder. Cystic and common ducts filled with scale-like débris and encrusted on duct walls; gall-bladder drained; not removed because of fear of recurrence from scale.

The remaining cases in my series were reported back as pathological gall-bladders. The greater number of these at the time of operation presented gross evidence of pathological conditions. There were some exceptions; two are worthy of note: Mr. D., aged 52, operated upon by Dr. John C. Munro ten years ago for carcinoma of lower lip (block dissection); no recurrence; has had indigestion for years. Clinical diagnosis: chronic appendix and gall-stones and some partial obstruction at splenic flexure. Roentgen diagnosis: pathological gall-bladder, chronic appendix and constriction in descending colon. Operative findings: chronic appendix, band formation across first portion of descending colon, gall-bladder normal appearing but glands on common cystic ducts enlarged. Gall-bladder drained; not removed because of condition of patient. Black, viscid bile drained for twenty-four days following the operation.

Conclusions: The number of cases on which my experience is based, while not very numerous, is sufficient to warrant my confidence in the ability of the x-ray to demonstrate pathological gall-bladder. These were selected cases in which the diagnosis was not clear (with the exception of two stone cases), but in which I suspected the gall-bladder of being responsible for most of the epigastric symptoms.

I consider the positive diagnosis of distinct corroborative value, and in doubtful cases shall continue to use it as I have for the past three years, and I believe the time is coming when it will be a routine procedure in suspected gall-bladder disease.

Book Reviews.

Organism and Environment as Illustrated by the Physiology of Breathing. By John S. Haldane, M.D., LL.D., F.R.S. Yale University Press. 1917.

The small volume introduced by this rather mystifying title is a popular forerunner of the Silliman Lectures delivered this fall at New Haven, and to be published in full technical detail later on.

There is no doubt that these two books will attract the wide and well-deserved attention which must be given to any writings by Professor Haldane on respiration. The activities of his laboratory upon this subject have been responsible for most of the modern knowledge of respiration and have actuated nearly all the modern work that has been done. It is certain to be a pleasure to many who have been unable to read the original investigations, which provide the data for the book in hand, to go carefully through the first three lectures.

In the first of these there is a careful account of the elementary facts relating to breathing, all of which plays about the question of the exact regulation of the CO_2 tension of the alveolar air. This leads necessarily into a discussion of the blood gases, the evidence that CO_2 acts physiologically as an acid, the significance of the excretion of this acid in maintaining the slight constant alkalinity of the blood, the dependence of the organism upon carbonic acid to obtain oxygen, and the dependence upon oxygen to get rid of carbonic acid. Every one of these considerations has crept into clinical medicine for proper understanding of acidosis, and the reader will find them within his grasp, however unaccustomed he may be to thinking in terms of physical chemistry.

But the book is not intended to be a monograph upon respiration, though this will undoubtedly become its real function. Through a realization of the enormous number of factors which play through the entire body upon the respiratory mechanism, apparently regulating it, in turn being governed by the very mechanism they regulate and becoming a definite part of it, the reader is to be led to a distrust of the possibility of ever explaining life upon a mechanical basis,—that is, through the aid of only such physical and chemical laws as we now have. Mechanism will not do in biology. "We can reach no other conclusion than that it is the very conceptions of matter and energy, of physical and chemical structure and its changes, that are at fault, and that we are in the presence of phenomena where these conceptions, so successfully applied in our interpretation of the organic world, fail us."

But vitalism in its turn may not be trusted far. For in the physiology of respiration alone, many facts which would have demanded vitalism a few years ago are found now to depend on very simple chemical regulation. In biology, life must be considered as primal, not of necessity antedated by and incident upon certain chemical and physical laws. We are to study life by every aid science possesses, realizing that, in the complex inter-relations which the body presents in such a function as breathing, we are dealing with a set of processes entirely without parallel in the inorganic world. Life may well provide new physical and chemical laws if it is studied from this point of view, yet it is doubtful if we shall ever obtain satisfactory ultimate explanation.

The philosophy demands a distrust of mechanism and a hesitating sort of vitalism which may, some day, be replaced by a sort of supermechanism built upon new laws to which life itself will furnish the clues. To those who read critically the author will undoubtedly appear a better physiologist than metaphysician.

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DIRECT MEDICATION.

THE establishment of confidence in the use of drugs in modern medicine is due largely to the separation of the active principle from the crude drug, to the more accurate dosage possible, to animal experimentation and to direct medication by means of the hypodermic needle. The administration of the active principle of the drug obviates the use of the inert matter that goes with the crude drug when administered by the usual route. The many ingredients of the old-time prescription, intended each to affect certain organs, or to combat certain symptoms, brought with themselves the almost impossible task of avoiding chemical and physiological incompatibilities. The present rise in the cost of all materials, in drugs, in solvents, in vehicles, would seem to emphasize the waste of the prescription method of medication. Moreover, the wide possibility for badly compounded, non-palatable, and often substituted drugs, are, though apparently somewhat minor objections, nevertheless, to be considered in choosing the method of administering drugs. For medication in the field, or for emergency medication, where bulk is prohibitive, the direct method of medication is the only possible method. Yet even the administration of active principles, singly as indicated, but by mouth, is not entirely without objection. Dosage by mouth requires larger quantities to allow for loss in transit through the intestinal tract than actually take part in the therapeutic action. Besides, drugs taken by mouth take a long time to manifest themselves, and fail where immediate, drastic action is demanded.

All these disadvantages are overcome by the direct method of medication with the hypodermic needle. Even before the common use of this method of medication, it had been understood that the direct method of medication was the only way to obtain rapid and immediate results. In any event, there can be no use in delaying the therapeutic effect of a drug when indicated. The disadvantages, if they may be thus called, of the direct methods, are that they can be administered only by trained attendants. It is obviously undesirable to have the administration carried out by the patient himself or by his friends. Moreover, the hypodermic needle is a surgical instrument and its use must be accompanied by all surgical aseptic precautions. In the use of narcotics over long periods the adverse psychological effect upon the patient in the matter of predisposing to the habit must be reckoned with.

Of the three methods of direct medication, the endermic, the hypodermic and the intravenous, the endermic is the least satisfactory and the least used. Introduction of drugs into the true skin is irritating, more painful and the rate of absorption is less. The most commonly used method is the hypodermic method, in which the drug is introduced under the skin into the subcutaneous areolar tissue. Introduction into the muscular tissue of drugs causes their absorption even more quickly than under the skin. For very rapid action of such drugs as mercury, camphor, atropine and strychnine, the intramuscular route is extremely useful. Certain muscles seem to absorb more quickly than others; the lumbar muscles, more quickly than the gluteal, and the pectoral more quickly than the lumbar. But the injection of foreign matter into the tissues, even though they are drugs purposed for therapeutic action, has all the disadvantages of the

injection of any foreign substance. There is the pain, the irritation and the injury to the tissues which may set up very marked inflammation, especially such drugs as mercury, arsenic, etc. Often deep abscesses and extensive necrotic areas may result. Proper technique, of course, minimizes these accidents. Repeated injections in individuals whose vitality is already much lowered, are additional violences to the tissues that may result disastrously.

However, the intravenous method of medication is becoming more popular because, while having all the advantages of direct methods of medication, has none of the disadvantages. Therapeutic action by the intravenous route is the most prompt of all. Even very large quantities of drugs may be introduced without the danger of injury to the tissues. In this method, of course, aseptic precaution must be observed, care taken not to injure the vein, air must be excluded to obviate the danger of air emboli, and above all the medicament must be introduced very slowly and deliberately, at the rate of a cubic centimeter in one minute. The use of any of the hypodermic methods provides for the administration of medicines at longer intervals because, so to say, the saturation or physiological limit is sooner reached and lasts very much longer. In disturbed or comatose patients the direct method of medication is practically the only possible method. At any rate, the increasing demand by physicians for drug products capable of direct administration into the circulation points to the direction in which the trend of modern therapeusis is going.

THE SPREAD OF THE HOOKWORM.

Most of us are already familiar with the economic aspects of the widespread hookworm infection in the South. Yet little has been said upon the possibility of the spread of this infection by prospective troops to be drawn from this highly infected locality. Stiles has just called attention to this matter in the Public Health Reports of August 17, 1917. The examination of recruits stationed on a government reservation, showed 63 per cent. infected with hookworm. Undoubtedly, examinations on a large scale would reduce this percentage, especially if statistics were compiled for the whole country. On the other hand, regiments taken wholly from the warm parts of this country might show even a larger percentage. The quartering of troops in various parts of the country for training or for other purposes in which there is any considerable percentage of infection, leaves the door open for country-wide infection with a proportionate increase of the problem already present in some of the Southern States.

Moreover, the nature of trench warfare and the mode of living involved therein, offers excellent means for the transmission of the disease directly and for the pollution of the soil permanently. The scale of infection may be large enough to reduce materially, or even to destroy the value of the military units sent. The epidemic in the building of the St. Gothard's tunnel and the one in the Andersonville stockade are notable examples of the vast proportions that such epidemics may reach. The permanent pollution of the soil in which infected armies may be engaged may create a post-bellum problem that may make reconstruction very difficult.

While the hookworm is the most important and the most common parasitic infection of man, there are others which act in the same way although some of them are less amenable to treatment. On the whole, hookworm infection is easy to cure by the intelligent administration of thymol. Of the other parasitic infections, such as the ascaris lumbricoides, hymenolepsis, strongyloides, etc., the latter mentioned is incurable. In any event the cure of isolated cases is not the aim of the sanitarian, particularly because the damage has already been done to the individual and he is lost to the organization, and the efficiency of the unit is already lowered. The prevention of hookworm is a comparatively easy problem requiring, after all, only the application of general hygienic principles. The prevention of soil pollution by proper privy arrangements will practically solve the problem; and the proper shoeing of the feet while in previously infected ground will prevent the ingress of the parasite through the skin. Hookworm is a disease of primitive sanitation and primitive mode of living.

The results of hookworm infection among recruits, the infection of communities wherein they are stationed and in the country wherein they are to fight, are so serious that no measure must be omitted that will prevent the entry of actively infected individuals from entering the military organization. If entry has nevertheless been effected there should be no discharge before

isolation, treatment and cure. In the prevention of the spread of this disease in this manner it would be quite feasible to examine each recruit for the presence of hookworm before admission to the military organizations. It has been suggested that the central laboratory method of examination of all individuals by trained workers would be the most efficient, cheapest and least likely to admit of duplication. An examination that fails in this particular, fails in a very vital element; and the expense of making these examinations would hardly equal the expense of maintaining the individual cases of disability.

VENEREAL INFECTION IN SOLDIERS, SAILORS, AND IMMIGRANTS.

THE mobilization of troops presents perhaps no greater sanitary problem than the prevention of venereal infection among them. It is said that venereal infection is the cause of the greatest amount of disability among troops. So large a factor has this been that military medical officers have devised and adopted the so-called prophylactic packet—20 per cent. calomel ointment, against syphilitic infection, a certain silver preparation against gonorrhea—to prevent infection. So much confidence is placed in the prophylactic value of the packet that infection with venereal disease is accepted as absolute evidence of failure to use it, and the disobedience is accordingly punished. This method has been criticized as encouraging immorality, but attempts to control venereal infection anywhere by moral suasion, segregation of prostitutes and the like have proven to be failures.

Yet in spite of the reputation of the soldier, and especially the sailor, for venereal infection, and the great pains taken to prevent it, there is no real evidence that, except for this time-worn reputation, they are more subject to venereal infection than other classes. It is barely possible that venereal infection is detected more frequently in the active stages in the soldier and the sailor than in other classes, but that is only because from the very nature of their calling they are subject to physical examination more frequently than others. Perhaps no other imputation has contributed so unjustly to the disrepute of the soldier and sailor than the imputation of almost universal venereal infection. When, however, the fact that venereal infection is widely distributed, skipping no classes, is understood; that the estimates of venereal infection at one time or another among all classes is even above 80 per cent.; that the number of marital, but innocent, infections among females is very large, and that it has been deemed necessary in many States to pass laws against the marriage of infected persons, it can be seen that venereal infection is hardly limited to the soldier or sailor. Moreover, the chance of exposure to venereal infection is much greater in civilians than in soldiers or sailors, because the former are continually exposed to infection, while the latter only for short and often far-removed periods between service. With the training of the soldier in modern times in general health and disease prophylaxis, the likelihood of infection will be much reduced, and perhaps to a lower degree than in any other class.

The same sort of misapprehension has existed in the popular mind about the importation of venereal disease by the immigrant. It is quite likely that the more cultured immigrant from the city is subject to the same degree of infection as the city people of this country. There is no evidence of any greater amount of infection. Only the actual amount of venereal infection can be increased by his importation but not the percentage. But in respect to the European peasant that emigrates to this country, whose previous life has been very primitive, and who, in keeping with all primitive life, has married early, the amount of venereal infection is negligible. Indeed, in so far as the peasant immigrant is a primitive being, it is he who becomes infected by the civilization into which he enters, just as it was the civilized peoples who introduced venereal and other diseases into the primitive peoples whom they attempted to develop.

Venereal disease is limited to no class but, rightly called, is a social disease, and correctible ultimately by the correction of social and other errors of living. In the meantime it must be controlled by medical prophylaxis.

MEDICAL NOTES.

STATE OF ILLINOIS DEPARTMENT OF PUBLIC HEALTH.—The Fiftieth General Assembly of the State of Illinois passed a consolidation bill which became law July 1, 1917. This bill, known as the Civil Administrative Code, created the Department of Public Health, abolished the State Board of Health, secretary and executive officer of the State Board of Health, and vested the

power to enforce the State Board of Health Act in the Department of Public Health.

All correspondence of an official nature, all bulletins and reports should be addressed to C. St. Clair Drake, M.D., Director, The Department of Public Health, Springfield, Illinois.

BRADY BEQUEST TO NEW YORK HOSPITAL.—An arrangement has been made by the executors of the estate of the late James Buchanan Brady and his heirs so that $3,000,000 of his fortune may be used at once by the New York Hospital. This makes possible the establishment of the James Buchanan Brady Foundation of Urology, for which a building will be erected to cost about half a million dollars. The plans for the foundation are in the hands of Dr. Oswald S. Lowsley, named by Mr. Brady as director.

ROCKEFELLER FOUNDATION.—Two hospitals in China, one at Peking and one at Shanghai, are to be built by the Rockefeller Foundation. The Foundation is also to send a hospital ship to the Moros and allied tribes of the Sulu Archipelago where it will cruise for five years among the islands in the Southern Philippine group, treating skin diseases, malaria, hookworm, dysentery and other tropical affections.

MEETING OF ORIFICIAL SURGEONS.—The annual meeting of the American Association of Orificial Surgeons will be held in Chicago on September 27, 28 and 29. Morning hours are to be given to clinics, and afternoon and evening sessions to papers and discussion. Dr. Benoni A. Bullock of Detroit, Mich., is secretary for the Association.

WAR NOTES.

UNIT FOR PHYSICAL TREATMENT.—Following is a synopsis of the unit which the American Electro-therapeutic Association would recommend to accompany every military hospital at the front and at the base.

1. *Purpose.*—The purpose of the unit is to furnish facilities and men to carry out in a thoroughly scientific manner treatment, by electrotherapeutic and other physical methods, of diseased conditions arising from injuries and from other causes associated with exposure of our men in the Army at the front.

2. *Scope.*—(*a*) Includes the treatment of infected wounds, delayed repair following injury, beginning gangrene, sprains, contusions, atrophies, various forms of arthritis, erysipelas, frost-bite, trench feet, flat-foot, and neuritis. (*b*) Instruction to physicians and nurses in preparation for the above work.

3. *Capacity and cost.*—In order to carry out this work properly, sufficient funds must be provided thoroughly to equip and maintain a unit. The committee recommends that such a unit form a part of every base hospital in this country and abroad. There are qualified physicians in readiness to fill these positions.

4. *Equipment.*—Equipment should include transformers and diathermic apparatus, x-ray apparatus for therapeutic use, the practical forms of static machines, therapeutic lamps, sinusoidal machines, and constant current apparatus.

AMERICAN RED CROSS IN RUSSIA.—Word has been received that the Commission sent to Russia under Dr. Frank S. Billings of Chicago, has arrived safely and has been duly received by Premier Kerensky. Upon receipt of this information Mr. H. P. Davison of the Red Cross War Council, cabled the following dispatch to Premier Kerensky:

"I have just received a cable announcement of the safe arrival in Petrograd of the American Red Cross Commission to Russia. The American Red Cross numbered nearly 3,000,000 American citizens, and wants you to know that the sending of this commission with the measures of relief which it conveys, and the others which, we expect, it will later administer, are tokens of the earnest sympathy of the American Red Cross for the people of Russia in their brave struggle for the establishment of democracy and for the perpetuation of a really independent national existence. The American Commission carried with it medical supplies to the value of $200,000. A second shipment of supplies is now being sent to Russia by the Red Cross. To cover this shipment the war council has appropriated $160,000."

COMMISSION FOR SERBIAN RELIEF.—The American Red Cross has appointed Dr. Frederick T. Lord and Dr. Eugene A. Crockett of Boston, and Dr. Severance Burrage, formerly of Boston, to constitute a commission to conduct relief work in Serbia.

WAR HOSPITAL IN NEW YORK.—Columbia Hospital, New York City, has been accepted by the Government and has been designated as United States Army General Hospital No. 1. This hospital is to be one of a series of general hospitals where men requiring prolonged periods of treatment, can be sent and thus relieve hospitals located nearer the front.

BRITISH DENTAL ASSOCIATION.—At the annual meeting of the British Dental Association held on July last, it was announced that of the 2,600 members of the Society, 600 were in military service either as dentists or as combatants. It was suggested that on the plan of the Canadian Army Dental Corps, the British Army organize a similar corps.

MILITARY ORTHOPEDICS.—The new department created by the Surgeon General known as the Department for Military Orthopedics, under the directorship of Maj. Elliott G. Brackett, will have its headquarters at the surgeon general's office. Maj. David Silver, M.R.C., is assistant director. The office of director of military orthopedics for the expeditionary forces will be filled by Maj. Joel E. Goldthwait, M.R.C. Maj. Robert B. Osgood, now serving with United States Base Hospital No. 5, and Capt. Nathaniel Allison, now serving with United States Base Hospital No. 21, will be transferred from their present positions to the same department, Maj. Osgood being assigned to the British forces, and Capt. Allison to the French and Italian forces. An advisory board has been appointed to assist the directors of the department, to which the following men have been appointed: Dr. Robert W. Lovett, Boston; Dr. Albert H. Freiburg, Cincinnati; Dr. G. Gwilym Davis, Philadelphia; Dr. F. H. Albee, New York; and Dr. John L. Porter, Chicago.

BUREAU OF SANITARY SERVICE.—The War Council of the American Red Cross has appropriated $800,000 for the establishment and maintenance of a Bureau of Sanitary Service to be under the leadership of Dr. W. H. Frost. This bureau is created for the purpose of caring for the sanitary and health conditions of mobilization camps and their environments. The Bureau is prepared to furnish sanitary units either to aid or supervise in such work and will do so upon request of proper civil authority. Units will consist of bacteriologists, sanitary inspectors, nurses and assistants. Dr. Frost has been with the Public Health Service for thirteen years and was active in the yellow fever epidemic of New Orleans in 1905.

APPOINTMENTS TO DENTAL CORPS.—It is reported that Dr. Albert Holman Staples of Brunswick, Me., has received a commission as first lieutenant in the Dental Section, Officers' Reserve Corps, U. S. A.

DEMONSTRATION BY DRS. CARREL AND DAKIN.—On August 12, the Rockefeller Institute for Medical Research formally opened its war demonstration hospital. The occasion was marked by a visit to that institution of the National Medical Council to study the methods of wound treatment by Drs. Carrel and Dakin. There were present beside Surgeon-General Gorgas and Dr. Franklin H. Martin of the Medical Bureau of the Council of National Defense, their staffs and a large number of army and medical reserve officers, the medical members of the British war mission and representatives of the French medical service. Dr. Carrel demonstrated the Carrel-Dakin method of wound irrigation and discussed methods of training medical officers in its use. Surgeon-General Gorgas made arrangements for a large number of officers to take a course in wound treatment under Dr. Carrel at the institution. The serum for the treatment of gangrene was demonstrated and it was announced that its use had progressed to a point where it might be used on human beings. A large number of horses have been inoculated with the bacillus and are now producing the serum, which will be furnished to the medical forces of the Allies.

GIFT OF DENTAL AMBULANCES.—It is announced that through the generosity of Mrs. William B. Thompson, the New York State troops will be provided with five dental ambulances. Money is being raised through the Preparedness League of American Dentists to equip an additional number of ambulances for the American Expeditionary Forces. The League states that twenty-seven per cent. of the men who apply for enlistment are rejected because of defective teeth.

MILITARY HOSPITAL ON GALLOP'S ISLAND.—It is reported that Gallop's Island is under consideration as a possible site for a military hospital. The island now harbors 270 interned Germans.

HOOKWORM AMONG AMERICAN RECRUITS.—Dr. Wardell Stiles of the Public Health Service has recommended careful examination of all recruits of the National Guard and the National Army, especially in the South, for the detection of hookworm. Recently in the examination of seventy-five recruits, hookworm was found present in forty-seven of the number. Dr. Stiles calls attention to the great danger of carrying the infection abroad, and urges thorough and systematic examination of all troops.

MEDICAL RESEARCH.—The American Red Cross has appropriated $100,000 to be used in medical research work in France. This is in pursuance of a recommendation of Major Grayson M. P. Murphy, Red Cross Commissioner to Europe, who sent the following message to the Red Cross Headquarters:—

"An extraordinary opportunity presents itself here for medical research work. We have serving with various American units, some of the ablest doctors and surgeons in the United States. Many of these men are already conducting courses of investigation which, if carried to successful conclusions, will result in the discovery of treatments and methods of operation which will be of great use, not only in this war, but possibly for years afterward. To carry on their work they need certain special equipment, and personnel cannot be obtained through ordinary government sources without delay, which makes this source of supply quite impracticable."

AMERICAN MEDICAL ACTIVITIES IN FRANCE.—French military authorities have turned over

to the medical corps of the United States Army, two large military hospitals and a large medical depot. These will be occupied by American base hospital units. The entire American force in France has been inoculated against typhoid and para-typhoid. A great field laboratory is under construction near the American training camp.

JOHNS HOPKINS UNIT IN FRANCE.—Johns Hopkins Hospital announces that the unit sent from its staff is now established in a base hospital in France, equipped for work. The various members of the staff have returned from their inspection of specializing hospitals and have divided the work of the hospital as follows:—

Dr. William S. Baer, the orthopedic surgeon, is specializing in wounds of the legs and feet; Dr. B. H. Bernheim in vein surgery; Dr. John J. Heuer in skull surgery; Dr. William Fisher, Jr., in abdominal wounds, and Dr. John S. Davis in skin grafting. Major J. M. T. Finney, head of the unit, is the general surgeon.

SICKNESS AMONG TROOPS IN FRANCE.—Report of sickness among American troops in France shows that whereas the rate in Army posts in the United States is 5 per cent., that in France is but 2½ per cent. Most of the sickness is made up of light cases of mumps, measles and colds.

VETERINARY CORPS.—The following men have been appointed to the advisory board for the Veterinary Corps of the Army: Dr. C. J. Marshall, Pennsylvania; Dr. David S. White, dean of the College of Veterinary Medicine, Ohio State University, Columbus, O.; Dr. Louis A. Klein, dean of the School of Veterinary Medicine, University of Pennsylvania; Dr. V. A. Moore, dean of the New York State Veterinary College, Cornell University, Ithaca, N. Y.; and Dr. John R. Mohler, assistant chief of the Bureau of Animal Industry, Washington, D. C.

WAR RELIEF FUNDS.—On September 6 the totals of the principal New England war relief funds reached the following amounts:

French Wounded Fund	$250,748.40
Children's Fund	214,116.17
Surgical Dressings Fund	122,634.70
Serbian Hospitals Fund	101,837.89
Polish Fund	84,595.95

BOSTON AND MASSACHUSETTS.

WEEK'S DEATH RATE IN BOSTON.—There were 217 deaths in Boston for the week ending Sept. 1, 1917, against 247 the corresponding week last year. The death rate was 14.65.

There were the following cases of communicable diseases reported: Diphtheria, 53; typhoid fever, 13; whooping cough, 18; scarlet fever, 21; measles, 16; tuberculosis, 63. Of these there were non-residents as follows: Diphtheria, 5; scarlet fever, 7; measles, 1; whooping cough, 2; and tuberculosis, 6.

The deaths from communicable diseases were as follows: Diphtheria, 5, non-resident, 1; scarlet fever, 1; typhoid fever, 1; whooping cough, 6, non-resident, 1; tuberculosis, 29, non-residents, 3.

The deaths under one year were 46, non-residents, 9.

NANTUCKET COTTAGE HOSPITAL.—An appeal is made for the support of the Nantucket Cottage Hospital, established in 1913, and since that time doing excellent work in a district unassisted by hospital help of any kind. In view of the increasing demands made upon it and in consideration of the position of the island, which will render it of great service in the event of war in these waters, it is the determination of its trustees to strengthen its support and enlarge and equip it to meet its present needs and possible emergencies. Through Mary E. Waller of Nantucket, Mass., it asks that contributions may be forthcoming to aid it in its increased usefulness.

PREGNANCY CLINIC.—The prenatal and obstetrical clinic held at the Out-Patient Department of the Peter Bent Brigham Hospital, under the auspices of the Women's Municipal League and in affiliation with the Boston Lying-in Hospital, reopened for the admission of patients on August 22. This clinic is established for persons of moderate means, in order that there may be available for them that care which the rich can afford and which the poor have given them.

The clinic offers to its patients the care of the most thoroughly trained obstetricians, with the help of a trained nurse, and includes visits by the patients to the prenatal clinic held every Wednesday from 3 to 5, by the doctors with the nurse in attendance; home visits to the patients by the nurse at least every ten days; the presence of both doctor and nurse at the delivery, and the customary number of visits for the after-care of mother and child.

The charge for this is $25, with a small extra charge for ether if it be required. The patients will be taught to make their own surgical supplies out of materials sold to them at wholesale rates, and these, when made, will be sterilized for them.

MEETING OF INDUSTRIAL ACCIDENT BOARDS.—At the evening session of the second day of the fourth annual meeting of the International Association of Industrial Accident Boards and Commissions, held in Boston, the subject under discussion was "Medical Competence and Hospital Efficiency." The speakers were Dr. F. D. Donoghue, medical adviser of the Massachusetts

Accident Board; Dr. J. W. Sever, Dr. F. J. Cotton, Dr. E. A. Codman and Dr. E. E. Southard. Dr. F. D. Patterson of the Pennsylvania Department of Labor and Industry, presided.

At the afternoon session, which was devoted to a discussion of compensation insurance, papers were read by Dr. W. A. Brooks, Dr. Timothy Leary, Dr. A. W. George, Dr. J. W. Brickley and Dr. W. Irving Clark.

The delegates were invited to attend the occupational diseases clinic of the Massachusetts General Hospital.

The Massachusetts Medical Society.

UNEXPIRED LEASES OF ENLISTED PHYSICIANS.

THE Chicago Rotary Club has learned that a great number of physicians, who have enlisted for service during the present war, are embarrassed by unexpired leases. In certain cases, such corporations from whom they rent have refused to cancel leases. It seems to the Chicago Rotary Club that when physicians are so much needed in the United States Army, every effort should be made to relieve them of contracts rightfully binding in times of peace, but which might better be waived in times of national peril.

We all know that the physician giving up an established practice to enlist, makes perhaps the biggest sacrifice of us all, because his business depends absolutely on personal contact. The day he leaves, his business ceases. But his lease goes on. Yet our country is calling for more physicians, and many patriotic doctors everywhere are trying to arrange their affairs to go.

It is possible to create a strong public opinion favoring the canceling of leases in such cases. If advisable, the matter can be carried for consideration to Congress. But first, the Physicians' Lease Committee wants figures and facts. We are sending this letter to 20,000 physicians scattered all over the United States. May we ask you personally to help us by promptly filling out and mailing to us a postal card, telling us if you have knowledge of such leases.

Your prompt co-operation will place in the hands of your committee the necessary data for an effective presentation of the facts before proper legislative bodies.

We want to help. We believe, in fairness to all, a great work can be done. When we receive your card, you will have our earnest thanks for your co-operation.

CHICAGO ROTARY CLUB,
PHYSICIANS' LEASE COMMITTEE,
R. R. Denny, *Chairman*,
Care of Dennos Food Sales Co., Chicago, Ill.

NOTES FROM THE DISTRICT SOCIETIES.

DISTRICT CORRESPONDENTS.

Berkshire, A. P. MERRILL, M.D., Pittsfield.
Bristol North, ARTHUR R. CRANDELL, M.D., Taunton.
Bristol South, EDWIN D. GARDNER, M.D., New Bedford.
Essex North, T. N. STONE, M.D., Haverhill.
Essex South, H. P. BENNETT, M.D., Lynn.
Hampden, LAURENCE D. CHAPIN, M.D., Springfield.
Hampshire, E. E. THOMAS, M.D., Northampton.

ESSEX SOUTH.—At a meeting of the Beverly Medical Fraternity, held August 27, 1917, the following resolution was adopted:

"In realization of the sacrifices assumed by members of our profession enlisted in the National Medical Service, we, the undersigned, wish to assign to the use of the families of the physicians so absent, a definite portion of the fees received by us from patients formerly employing these physicians. For this purpose we pledge ourselves."

(Signed by Members of the Fraternity)

It was voted that one-third of the fees collected be apportioned to the men absent in the National Medical Service, and be deposited in the Beverly National Bank to the credit of the joint account of the absent member and his wife.

A copy of the resolution to be posted in the offices of the physicians.

RALPH E. STONE, *Secretary*.

ESSEX NORTH.— Lawrence doctors who have been already ordered into the service are: Maj. H. H. Davis, National Guard, Boxford; Captain J. F. Burnham, Fort Benjamin Harrison; Lieut. W. M. Crandell; Lieut. J. M. Scanlon, Army Medical College, Washington; also Lieut. H. A. Clark, North Andover.

W. H. MERRILL, M.D., *Reporter*.

FRANKLIN.—The following appeal has been sent to all physicians in the district:

"About the middle of April the Franklin County Branch of the Massachusetts State Committee for Medical Preparedness was organized at a meeting called by Dr. Howe of Greenfield, President of the Franklin District Medical Society.

"At this meeting ways and means of encouraging members of the profession in Franklin County who are eligible to join the Officers Reserve Corps were discussed, and it was decided to send to each individual a personal appeal, but before the latter could be prepared, the State Committee on Medical Preparedness sent out survey cards to every physician in the State and, as this attempt of informing our profession seemed to be sufficent for the time being, nothing more was done by this Committee.

"Now, however, we learn that a great many of the cards sent out have not as yet been re-

turned properly filled out. How many of these failures come from our county we are not now in a position to say, and though we believe that no physician in Franklin would intentionally fail to supply the information desired, or to do everything possible to discharge his part of the obligation assumed when our government declared war, yet because it is possible that some of us have overlooked the matter and have not yet given the need the very serious consideration it deserves, we desire to call your attention to the following:

"Fifty-eight hundred survey cards were sent out and only 3500 were returned. Are you one of the delinquents?

"2. Have you seriously considered the help that you might render by joining the Officers' Reserve Corps and that you are eligible if between the ages of 22 and 55 and can pass the required physical examination?

"3. Do you realize that an early, and, we hope, a successful, outcome of this horrible affair can be brought about only by a quick, hard punch from this country, and that such a punch can be maintained only by having the medical arm as numerous and as efficient as possible?

"4. Do you recall the condition of the returning soldiers in 1898, and didn't you individually resolve that if the medical profession ever had another chance you would do your bit toward reducing the terrible toll which disease took then as it always had done in other wars?

"5. Have you done anything to ascertain the real need for your services at this time? If not, won't you mull over these facts:

"Over 25,000 medical men will be needed to keep the proposed National Army in good physical condition while they are in training.

"That France today would not be honeycombed with tuberculosis if her medical arm could have been more numerous and they could have had a keener sense of the importance of sanitation as a preservative of armies.

"That England has been obliged to put her hand on every medical man under 57 years of age.

"That there are often ten, fifteen and even twenty thousand soldiers to the mile of trenches on the western front with all that that congested number means in the promotion of disease.

"That when such battles as that of the Somme, Arras and Ypres open, there may be twenty to thirty thousand wounded during the first hour.

"That no medical man can offer any conscientious objections to service because all of his work is constructive rather than destructive.

"That the reward in experience and prestige is greater than any service an individual may be able to render.

"That medical men have never failed to respond to a call for service.

"(Signed) FRANKLIN COUNTY COMMITTEE FOR MEDICAL PREPAREDNESS."

Miscellany.

THE DRAFTING OF MEDICAL STUDENTS.

THE Mayor's Committee on Hospital and Medical Facilities in New York, which advocates the retention of medical students in the medical schools and of hospital internes in the hospitals under army assignment, with the object of keeping the army supplied with young medical graduates throughout the period of a long war, has halted its preparations for the introduction of a relief measure in Congress, owing to the receipt of word that the district boards of St. Louis and Cleveland have decided to exempt medical students under the law as it stands.

The district board of Cuyahoga County, which covers the city of Cleveland, has adopted and is acting on the following resolution:

"RESOLVED, It is the opinion of this board that men of the medical profession, including not only those who are regularly practising medicine, but also students of medicine, duly enrolled in any recognized school or college, should be temporarily discharged from service as being engaged in an industry which is necessary to the maintenance of the military establishment and the national interest during the emergency.

"It seems almost impossible to conceive of any form of activity in which a man is of more importance to his country at this period than in the medical profession. There is a great shortage of surgeons and other medical men abroad, and this country is being called upon to provide an ever increasing number for service at the front.

"The effect of this will, of course, be greatly to diminish the supply at home. It seems of prime importance, therefore, that those regularly practising be allowed to continue such practice until the government calls upon them for service in the capacity in which they can be most useful, and of equal importance, that students be allowed to continue their course of instruction in order that they may prepare themselves more perfectly for important duties at a later date.

"It will be the policy of this board in these cases, particularly in the case of students, to grant temporary certificates of discharge requiring the claimant to report at intervals and present proof to the board that he is continuing his studies in a manner satisfactory to his instructors and is making the progress which the board anticipates in granting the discharge."

In the discussion of this resolution, Chairman Johnson said:

"It is of the utmost importance that medical students should be kept in school until they have completed their studies.

"Medical students are performing, or will be capable of performing, much more important public service than men engaged in manufacturing plants. It is the most important service I can conceive.

"Although there have been different rulings on this question, I want it to go out from Cleveland that this district board of appeals is strongly in favor of exempting medical students.

"A year from now we know that these men will be badly needed, critically needed by their country. All the nations at war are terribly short of doctors."

The message from St. Louis reads as follows:

"August 28, 1917.

"Dr. S. S. Goldwater,
Mayor's Defense Committee,
New York, N. Y.

"Dear sir:—

"We are informed that the district board will exempt senior medical students who present individual claims for exemption. I enclose a form of affidavit which is used by students in the presentation of their individual claims to the district board.

(Signed) "H. W. LOEB, M.D., *Dean*,
"St. Louis University School of Medicine."

The form of affidavit referred to in Dr. Loeb's letter, follows:

"To the district board .....

"I hereby claim exemption from the draft in accordance with the provision of the act which authorizes the exclusion or discharge of 'persons engaged in industries, including agriculture, found to be necessary to the maintenance of the military establishment or the effective operation of the military forces or the maintenance of national interest during the emergency' for the following reasons:

"1. I do not desire in any way to evade service for my country during the war; on the contrary, I hereby offer myself for service in any of the special fields for which I shall be equipped when I receive my diploma in medicine, or if required by the regulations of the medical department of the United States Army and Navy, when I shall have completed my year of interneship.

"2. I am a student of medicine in the St. Louis University School of Medicine and expect to complete my work on ..... The St. Louis University School of Medicine is one of the now comparatively few medical institutions engaged in the education of physicians as a distinct and proper industry 'necessary to the maintenance of the military establishment and to the effective operation of the military forces and to the maintenance of the national interest during the emergency,' in that the said institution takes the raw material, *viz.*, the college student, and, after due process, places him at the service of the public as its finished product, *i. e.*, the qualified physician or surgeon.

"3. By reason of the increased range of the science and art of medicine and the consequent greater amount of time necessary to perfect a student in medicine, the educational requirements have been greatly increased and the period of medical instruction greatly lengthened.

"4. The effect of this has been to reduce greatly the number of graduates representing the output of the various medical institutions which for the past fifteen years has been getting smaller and smaller.

"During the nine years from 1900 to 1908, inclusive, the output of medical graduates numbered 47,797; during the subsequent nine years ending 1917, the number was 33,725, a decrease of over 14,000. In 1900 there were 5,214 graduated, and in 1917, only 3,399, a decrease of 1,815.

"5. Many new fields have opened to medical men which absorb, year by year, an increasing number who do not enter the practice of medicine.

"6. If 1,000,000 men are called from the civil fields of work to serve in the army, it will only slightly modify the number of practitioners required from the civil population, while, according to the latest information, 7,000 medical men will be required to man the regiments constituted by them.

"7. It is said that more than 10,000 medical men have already joined the Officers' Reserve and that two or three times as many are desired. No man other than a physician can perform the work of a medical man and hence, in fulfilling the demand for such large numbers of trained men, great harm to the people and the nation may result if the supply as determined by the output of the medical institutions is not carefully conserved.

"8. Under instructions from the Medical Council of National Defense, and the Surgeon General of the Army, students were discouraged from enlisting and were consequently, through no fault of themselves, denied the opportunity of preparing themselves for the Officers' Reserve for which many of them, being college men, might have qualified.

"9. The experience of both England and France has shown that 'the maintenance of the military establishment, the effective operation of the military forces and the national interest during the emergency' were seriously threatened by permitting the enlistment of ungraduated medical students, and the output of physicians during the three years of war has, for this reason, been seriously reduced.

"10. For these reasons dependent upon the grave danger to the nation of interfering with the important industry of educating medical men, already greatly curtailed by the requirements of time and expense, I ask exemption until such a time when my training may be completed and when I may offer myself to my country as a trained man who is capable of rendering efficient service through the agency of medical science."

The New York City district board, under the jurisdiction of ex-Justice Charles E. Hughes, decided a week ago that it was powerless to do what the St. Louis and Cleveland boards have now done, but appreciating the urgency of the matter, appealed to Washington for a modification of the existing regulations.

The University of Alabama, which is one of the medical colleges heard from since the publication of the last returns, furnishes the highest percentage yet given of drafted medical students, reporting 57% of the class of 1918 drafted, 60% of the class of 1919, 37% of the class of 1920, and 50% of the whole school.

A note of alarm is sounded in a letter from the dean of the University of Mississippi, who reports that 30% of their students will be taken under the first draft, and not less than 50% under the second. The dean of the Mississippi school fears that medical students will become entirely extinct in the state. This year only twenty medical graduates have applied for medical licenses, as compared with sixty to seventy in previous years.

INFORMATION AS TO PHYSICIANS EMPLOYED UNDER CONTRACT.

THE Surgeon General has authorized the employment of physicians under contract for limited service. The contract doctor is given a contract for a definite class of work at a definite place. At the termination of that work his contract can be annulled if so desired, or he can be continued in service and given another assignment. He is practically still a civilian, has received no commission and has been obliged to pass no physical examination. He acquires no claim against the government for disability incurred in the line of duty. He is obliged to wear uniform and has a compensation of one hundred and fifty dollars per month, with mileage for travel under order. The executive officers of the Surgeon General's office are very much opposed, and for excellent reasons, to offering commissions in the Medical Reserve Corps for temporary service. It will be best in the future to give men who can render only such temporary service contracts instead of temporary commissions, so that there will be only two classes of men: first, officers of the Medical Reserve Corps, commissioned for service during the war, and second, contract doctors employed for a comparatively brief period. Physicians accepted for the Medical Reserve Corps can take contracts for service until they have received and accepted their commissions, when the contract will be annulled.

It will be seen that the contract system enables the government to make use of the large number of physicians who from partriotic motives are desirous of rendering some service, but feel themselves unable to accept a commission for service during the war.

INFORMATION FOR EXAMINERS ACCEPTING SERVICE AS CONTRACT SURGEONS.

CONTRACT surgeons rank as first lieutenants. They are required to wear uniform at all times when on active service. They wear the caduceus and the first lieutenant's bar, but no other insignia. The uniform designated is of olive drab cloth, either woolen or cotton. Cotton is much cheaper and is desirable during the summer and in warmer climates. Ready-made suits can be obtained for $16 in Washington and can be had at still more reasonable prices in some other places. The most economical arrangement is to have one cotton suit upon leaving home and, if other clothes are needed, to obtain such as are issued to the soldiers from the quartermaster, who will probably be able to supply them at camp. Olive drab woolen suits cost not less than $40, made to order, but can be obtained much more cheaply ready-made and especially if obtained from the quartermaster. A woolen suit would not be necessary in warm weather. The campaign hat costs from $3 to $5. The best quality Stetson hat is more comfortable, but more expensive. The cord costs $1. Russet leather leggins and russet leather shoes are also required, but any russet shoes may be worn. Bedding must be provided. The simplest way is to wrap blankets and a pillow together with a telescopic field cot and such articles of clothing as will not be injured by rolling, in a piece of canvas which is securely tied with rope and checked as baggage. Toilet articles, etc., may be carried in a hand bag. The so-called locker trunk for officers is very convenient, but a bedding roll and hand bag will carry all of the necessities. A basin and tin cup will be needed at camp, but can probably be procured on arrival. Physicians are requested to take their own stethoscopes with them.

Officers and contract surgeons are entitled to mileage at seven cents a mile from their home address, as given at the time of their appointment, to their station of active duty, payable after the journey has been performed. To secure this mileage a special voucher, procurable from the quartermaster's pay officer at the camp, must be filled out and the order of appointment to duty attached to it. The order to the Adjutant General must, therefore, be preserved. Upon arrival at the camp, report should be made in person to the commanding officer, which is done by visiting the Adjutant, presenting your order, stating your name and that you desire to report for duty, giving the date of your departure from your home or previous station. The Surgeon of the camp will undoubtedly be glad to give any advice and assistance needed thereafter.

HOSPITAL SHIPS IN WAR TIMES.

THE following account of a hospital ship appears in a recent number of the *Lancet:*

A paper on his experiences afloat by Dr. Oudard, staff-surgeon of the French Navy, has recently appeared in the *Archives de Médecine Navales.* He notes that the French have long employed hospital ships in their colonial wars, and that indeed in 1877 they built the *Annamite* as a hospital ship. She turned out so well that five others followed her, giving in his experience greater satisfaction than can be obtained from any converted merchantman. He wishes to see a fleet of steady ships built, about 10,000 tons and 15 knots, leased in peace time to commercial companies as passenger steamers, available at once on the outbreak of war, and each carrying 600 bed cases in single-tier cots. This is done in Japan. The worst cases would be in a ward with two operating theatres adjacent, while a small room for dressing cases is to be annexed to each of the other wards. The ships are to be planned for easy loading without too steep gangways; that means, we suppose, a suitable entry-port or baggage port on each deck; doors and passageways are to be wide enough to admit stretchers easily, and there are to be suitable derricks, or cranes, for hoisting and lowering patients in rough weather. These desiderata are quite in line with English practice, though we have few hospital ships specially built as such. He tells us of the help the French hospital ships were to the army at the beginning of the war, when the battles of the Yser were being fought, and the wounded were many. The ship would lie in a northern Channel port and at first she took the wounded as they were brought down by trains or ambulances, straight off the field. When the ship was as full as she could hold, about twice her calculated capacity, she would put to sea, and in a few hours discharge her patients somewhere in the west, every exertion having been made on board for the wounded, though little, except what was urgently necessary, could be achieved. Still, the wounded were greatly better off on shipboard, the pitching and rolling of a ship being far better borne, particularly by fracture cases, than the constant jolting of a train. Later on, as additional hospital ships came into service, they were less hurried, and could lie at bases, doing the duty of comfortable base hospitals, in France, at Mudros, and elsewhere. Popular report in the army credits the French hospital ships with a great deal of good work. The question of personnel is important. Dr. Oudard requires 10 orderlies for every 100 patients. In the hospital ships or barges used by the Austrians on the Danube and Save, and only employed over short distances, there were 12 orderlies for every 100 "lying" cases and four for every 100 "sitters."[1]

[1] Military Surgeon, Vol. xl, p. 651, June, 1917.

CANCER DECALOGUE PREPARED BY THE STANDING COMMITTEE ON THE CONTROL OF CANCER OF THE MASSACHUSETTS MEDICAL SOCIETY.

1. The classical signs of cancer are the signs of its incurable stages. Do not wait for the classical signs.

2. Early cancer causes no pain. Its symptoms are not distinctive, but should arouse suspicion. Confirm or overthrow this suspicion immediately by a thorough examination and, if necessary, by operation. The advice, "Do not trouble that lump unless it troubles you," has cost countless lives.

3. There is no sharp line between the benign and the malignant. Many benign new growths become malignant and should, therefore, be removed without delay. All specimens should be examined microscopically to confirm the clinical diagnosis.

4. Precancerous stage. Chronic irritation is a source of cancer. The site and the cause of any chronic irritation should be removed. All erosions, ulcerations, and indurations of a chronic character should be *excised.* They are likely to become cancer.

5. Early cancer is usually curable by radical operation. The early operation is the effective one. Do not perform less radical operations on favorable cases than you do on unfavorable ones. The chances for a permanent cure are proportionate to the extent of the first operation. Make wide dissections; incision into cancer tissue in the wound defeats the object of the operation and leads to certain local recurrence.

6. Late cancer is incurable, though not always unrelievable. Radium, x-rays, ligation, cautery, or palliative operations may change distress to comfort and may even prolong life.

7. Cancer of the breast. All chronic lumps in the breast should be removed without delay. Benign tumors can be removed without mutilation. Examine all specimens microscopically. An *immediate* microscopical examination is desirable since, if positive, it permits a radical operation at the same sitting. A radical operation performed ten days after an exploration is almost never successful in curing cancer of the breast.

8. Cancer of the uterus. Any irregular flowing demands thorough investigation. Offensive or even very slight serous flows are especially suspicious. Curette and examine microscopically. Amputate all eroded cervices which do not yield promptly to treatment. Do not wait for a positive diagnosis.

9. Cancer of the digestive system is difficult of early diagnosis, and therefore unfavorable in prognosis. All persistent and recurring indigestions (more especially if attended by change of color and loss of weight) and any bleeding

or offensive discharges demand prompt and thorough investigation. Do not wait for a positive diagnosis.

10. Cancer of the skin. Any warts, moles, or birthmarks which enlarge, change color, or become irritated, should be removed promptly. They are likely to become cancer. Do not wait for a positive diagnosis.

UNITED STATES CIVIL SERVICE EXAMINATIONS.

SEPTEMBER 18, 1917.

EXPERTS IN THE PREVENTION OF INFANT MORTALITY.

The United States Civil Service Commission announces an open competitive examination for experts in the prevention of infant mortality, for both men and women. Vacancies in the Children's Bureau, Department of Labor, at salaries ranging from $2,400 to $3,600 a year, with actual traveling expenses and a per diem in lieu of subsistence while absent from headquarters on official business, and in positions requiring similar qualifications, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

The duties of appointees will be to plan and conduct investigations into the causes of infant, child, and maternal mortality in selected communities, rural and urban; into the methods of their prevention; and into dangerous and injurious occupations and other matters relating to the health of children. Appointees may also be required to investigate maternal and child welfare through the holding of conferences

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated, on a scale of 100: (1) Education and experience, 70; (2) Publications or thesis, 30.

Graduation from a medical school of recognized standing and at least three years' specialization in the hygiene and diseases of childhood, or in the prevention of infant and child mortality by public or private agencies, are prerequisites for consideration for these positions.

Under the second subject, the applicant may submit publications on matters pertaining to child hygiene or the prevention of infant and child mortality, or a thesis on one of these subjects, or both such publications and thesis.

Statements as to education and experience are accepted subject to verification.

An oral test will be given at selected centres on a later date. In order to be eligible for the oral test competitors must attain an average percentage of at least 70 in education and experience and the publications or thesis. The oral test will be given to competitors in the order of their average percentages in the above subjects, and only to such number as will be necessary to meet the needs of the service. A competitor who fails to pass the oral test will not be eligible for appointment. Competitors will be notified of the date and place of the oral test.

Applicants must not have reached their fifty-fifth birthday on the date of the examination.

Applicants will be admitted to this examination regardless of their residence and domicile; but those desiring permanent appointment to the apportioned service in Washington, D. C., must have been actually domiciled in the State or Territory in which they reside for at least one year previous to the examination, and must have the county officer's certificate in the application form executed.

This examination is open to all citizens of the United States who meet the requirements.

ASSISTANTS IN THE PREVENTION OF INFANT MORTALITY. (FEMALE).

The United States Civil Service Commission announces an open competitive examination for assistants in the prevention of infant mortality, for women only. Vacancies in the Children's Bureau, Department of Labor, at salaries ranging from $1,800 to $2,400 a year, with actual traveling expenses and a per diem in lieu of subsistence during absence from headquarters on official business, and in positions requiring similar qualifications will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

The duties of appointees will be to assist in conduction in rural and urban communities investigations into the causes of infant, child, and maternal mortality, and into community measures for their prevention, especially into infant, prenatal and obstetrical nursing and care; and to make reports on these subjects with recommendations for improvement in such care, based on the experience of successful work in other communities.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated, on a scale of 100: (1) Education and experience, 70; (2) Publications or thesis, 30.

Graduation from a school of nursing connected with a general hospital having a daily average of thirty patients or more, after a continuous hospital training of not less than two years is a prerequisite for consideration for these positions. This education shall include practical experience in caring for men, women, and children, together with theoretical and practical instruction in medical, surgical, obstetrical, and children's nursing. Special credit will be given for academic training in addition to the specialized education required.

In States having nurse-practice laws, registration is also a prerequisite for eligibility.

In addition to the above prerequisites, the applicant must have had at least eight months' study at a school of recognized standing giving postgraduate work in public-health or visiting nursing and at least two years' experience in infant and maternal welfare nursing, or in public-health or visiting nursing which has included these branches. Five years of executive work in public-health or visiting nursing will be accepted in lieu of the eight months' postgraduate work in public-health or visiting nursing.

Under the second subject the applicant may submit publications on matters pertaining to infant or child welfare, prenatal and obstetrical nursing, or to community work for the prevention of infant and child mortality, or a thesis on one of these subjects, or both such thesis and publications.

Statements as to education and experience are accepted subject to verification.

An oral test will be given at selected centres on a later date. In order to be eligible for the oral test, competitors must attain an average rating of at least 70 per cent. in education and experience and the publications or thesis. The oral test will be given to competitors in the order of their average percentages in the above subjects and only to such number as will be necessary to meet the needs of the service. A competitor who fails to pass the oral test will not be eligible for appointment. Competitors will be notified of the date of the oral test.

Applicants must not have reached their fiftieth birthday on the date of the examination.

Applicants will be admitted to this examination regardless of their residence and domicile; but those desiring permanent appointment to the apportioned service in Washington, D. C., must have been actually domiciled in the State or Territory in which they reside for at least one year previous to the examination and must have the county officer's certificate in the application form executed.

The medical certificate in the application form must be executed.

This examination is open to all female citizens of the United States who meet the requirements.

EXPERTS IN CHILD WELFARE.

The United States Civil Service Commission announces an open competitive examination for experts in child welfare, for both men and women. Vacancies in the Children's Bureau, Department of Labor, at salaries ranging from $1,800 to $2,400 a year, with actual traveling expenses and a per diem in lieu of subsistence during absence from headquarters on official business, and in positions requiring similar qualifications will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

The duties of such experts will be the planning, supervision, and writing of reports on special studies of the various aspects of child welfare which the Bureau is directed by law to investigate and upon which it is directed to report: "Infant mortality, the birth-rate, orphanage, juvenile courts, desertion, dangerous occupations, accidents and diseases of children, employment, legislation affecting children in the several States and Territories." Applicants should be specially qualified by training and experience for the direction of studies and for the writing for publication of clear, readable reports upon at least one of these subjects. Applicants may be required to plan and supervise field studies requiring knowledge of statistics and of statistical methods as well as of the methods and technique of field investigation.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated, on a scale of 100: (1) Education and experience, 60; (2) Publications or thesis, 40.

As prerequisite for consideration for these positions the applicant must have an educational training at least equivalent to that required for a bachelor's degree from a college or university of recognized standing, such training to have included two or more years' special training in sociological or industrial subjects; and at least three years' experience in professional sociological or industrial investigation or research, or in professional journalistic or literary work including the writing of special articles primarily relating to sociological or industrial questions. This experience must have been of such a character as clearly to fit the applicant for the preparation of reports based either upon individual research or upon special field studies.

In considering equivalents for a bachelor's degree or college work credit will be given for experience in industrial or sociological work satisfactory to the Commission.

Under the second subject the applicant may submit publications on sociological or industrial subjects or on some subject connected with child welfare, or a thesis on any of these subjects, or both such publications and thesis.

Statements as to education and experience are accepted subject to verification.

An oral test will be given at selected centres on a later date. In order to be eligible for the oral test competitors must attain an average rating of at least 70 per cent. in education and experience and the publications or thesis. The oral test will be given to competitors in the order of their average percentages in the above subjects and only to such number as will be necessary to meet the needs of the service. A competitor who fails to pass the oral test will not be eligible for appointment. Competitors will be notified of the date and place of the oral test.

Applicants must not have reached their fiftieth birthday on the date of the examination.

Applicants will be admitted to this examination regardless of their residence and domicile; but those desiring permanent appointment to the apportioned service in Washington, D. C., must have been actually domiciled in the State or Territory in which they reside for at least one year previous to the examination, and must have the county officer's certificate in the application form executed.

The medical certificate in the application form must be executed.

This examination is open to all citizens of the United States who meet the requirements.

Applicants should at once apply for Form 2118, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.; the Secretary of the United States Civil Service Board, Post Office, Boston, Mass., Philadelphia, Pa., Atlanta, Ga., Cincinnati, Ohio, Chicago, Ill., St. Paul, Minn, Seattle, Wash., San Francisco, Cal.; Customhouse, New York, N. Y., New Orleans, La., Honolulu, Hawaii; Old Customhouse, St. Louis, Mo.; Administration Building, Balboa Heights, Canal Zone; or to the Chairman of the Porto Rican Civil Service Commission, San Juan, P. R. Applications should be properly executed and must be filed with the Commission at Washington, with the material required, prior to the hour of closing business on September 18, 1917. The exact title of the examination, as given at the head of these announcements, should be stated in the application form.

RECENT DEATHS.

ABNER TOOTHAKER WELLS, M.D., a fellow of the Massachusetts Medical Society, died in a sanatorium at Waukesha, Wisconsin, August 17, 1917, aged 44. Dr. Wells was born at Phillips, Maine, and was graduated from Baltimore University School of Medicine in 1899, and joined the Massachusetts Medical Society from Jamaica Plain in 1900. He had practised in Kendallville, Indiana, and in Canton, Ohio, of recent years. About a year ago he was in West Springfield, Massachusetts, living with his sister, Mrs. George E. Grover. He leaves another sister and four brothers.

HENRY WILLIAM CRONIN, M.D., died at Worcester, August 20, 1917, aged 54 years. He was a graduate of the College of Physicians and Surgeons, Baltimore, in 1893, and joined the Massachusetts Medical Society from Millbury in 1896, having practised in Worcester for many years.

HOMER H. WARNER, M.D., surgeon in the First Massachusetts Cavalry in the Civil War, died at his home in New York City on August 12. Dr. Warner was born in Norwalk, Conn., in 1837. In 1862 he was appointed surgeon and served throughout the war. He had been a member of the Old Guard for the past forty-two years.

CHARLES A. HAMM, a dentist in Brockton, Mass., was found dead at his office in that city. Death was due to natural causes. Dr. Hamm was born in Washington, D. C., in 1881, and graduated from Tufts Dental School. He had been in practice in Brockton for the past four years.

APPOINTMENT.

DR. WILLIAM H. WELCH, formerly head of the department of pathology at Johns Hopkins University, has been appointed director of the School of Hygiene and Public Health.

DR. W. G. MCCALLUM of Columbia University will succeed Dr. Welch in the position of pathologist at Johns Hopkins University.